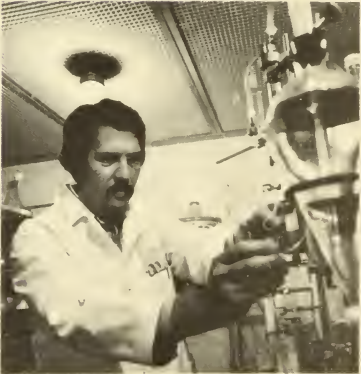

West Virginia University Bulletin

1978-79

Graduate School Catalog



COVER: The world's first electronic monitoring system to improve coal mine health and safety was developed by a team of electrical engineering professors at West Virginia University.



**WEST VIRGINIA
UNIVERSITY**

**1978-79
Graduate School Catalog**

1978

JANUARY	FEBRUARY	MARCH	APRIL
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1979

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UNIVERSITY CALENDAR, 1978-79

Summer, 1978

May 22, Monday	Registration, First Summer Session
May 23, Tuesday	First Classes
May 29, Monday	Memorial Day Recess
June 30, Friday	Last Classes
June 30, Friday	Registration, Second Summer Session
July 3, Monday	No Classes
July 4, Tuesday	Independence Day Recess
July 5, Wednesday	First Classes
August 11, Friday	Last Classes

First Semester, 1978-79

August 20, 21, Sunday and Monday	Freshman Orientation
August 21, 22, Monday and Tuesday	Registration
August 23, Wednesday	First Classes
September 4, Monday	Labor Day Recess
October 10, Tuesday	Faculty Assembly
October 13, Friday	Mid-Semester
October 20, Friday	Mid-Semester Reports Due
November 22, Wednesday, to November 26, Sunday, incl.	Thanksgiving Recess
December 8, Friday	Last Classes
December 11, Monday, to December 16, Saturday, incl.	Final Examinations
December 17, Sunday, to January 1, Monday, incl.	Christmas Recess

Second Semester, 1978-79

January 2, 3, Tuesday and Wednesday	Registration
January 4, Thursday	First Classes
February 7, Wednesday (not a holiday)	West Virginia University Day
February 19, Monday	Washington's Birthday Recess
February 23, Friday	Mid-Semester
February 24, Saturday, to March 4, Sunday, incl.	Spring Recess
March 7, Wednesday	Mid-Semester Reports Due
April 10, Tuesday	Faculty Assembly
April 16, Monday	Easter Recess
April 27, Friday	Last Classes
April 30, Monday, to May 5, Saturday, incl.	Final Examinations
May 7, Monday	Grade Reports for All Graduates Due in Dean's Office
May 8, Tuesday	Dean's Reports for All Graduates Due in Office of Admissions and Records
May 12, Saturday	Alumni Day
May 13, Sunday	Commencement

The academic year is divided into two semesters of approximately seventeen weeks and summer sessions.

It is the policy of West Virginia University to provide equal opportunities to all prospective and current members of the student body, faculty, and staff on the basis of individual qualifications and merit without regard to race, color, religion, sex, national origin, age, or handicap. The University neither affiliates knowingly with nor grants recognition to any individual, group, or organization having policies that discriminate on the basis of race, color, religion, sex, national origin, age, or handicap, as defined by applicable laws and regulations.

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Charleston, WV 25301**

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CORRESPONDENCE

Address as follows:

Academic Programs

Vice President and Provost for Academic Affairs

Admissions, Catalogs, Records

Dean of Admissions and Records

Graduate Programs

Dean of Graduate School

Housing

Director of Housing

Loans, Scholarships, Work-Study

Financial Aid Office

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and Research*

Student Life

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Veterans Affairs

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Morgantown, WV 26506**

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School of Pharmacy, Louis A. Luzzi

School of Physical Education, C. Peter Yost

Potomac State College, A. Gordon Slonaker

School of Social Work, Anita S. Harbert (*Acting*)

Student Educational Services, Joseph C. Gluck

Directors

Air Force Aerospace Studies (ROTC), Col. Brent A. Cool

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Housing, Robert A. Robards

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Military Science (ROTC), Lt. Col. Roger D. Harms
Mountainlair, Tommy R. Tucker
Parking, Motor Pool, Bus and Mail Service, Eugene F. Powell
Personnel, S. Thomas Serpento
Physical Plant, Vergil B. Clark
Purchasing, Ronald C. Jones
Radio, Television, and Motion Pictures, C. Gregory Van Camp
Regional Research Institute, William H. Miernyk
Security, William S. Strader
University Hospital, Eugene L. Staples
University Relations, Harry W. Ernst
University Editor, John Luchok

Distinguished Professors

Orrin B. Conaway, Jr., Ph.D., *Claude Worthington Benedum Professor of American Government and Administration.*
Bernard R. Cooper, Ph.D., *Claude Worthington Benedum Professor of Physics.*
Samy E. G. Elias, Ph.D., *Claude Worthington Benedum Professor of Transportation.*
Edmund B. Flink, M.D., Ph.D., *Claude Worthington Benedum Professor of Medicine.*
Gabor B. Fodor, Ph.D., *Centennial Professor of Chemistry.*
Ruel E. Foster, Ph.D., *Claude Worthington Benedum Professor of American Literature.*
Frank Gagliano, M.F.A., *Claude Worthington Benedum Professor of Theatre.*
Nicholas Georgescu-Roegen, Ph.D., *Claude Worthington Benedum Visiting Professor of Energy Economics.*
Frank M. Kearns, A.B., *Claude Worthington Benedum Professor of Journalism.*
Thomas P. Meloy, Ph.D., *Claude Worthington Benedum Professor of Mineral Processing Engineering.*
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Hayne W. Reese, Ph.D., *Centennial Professor of Psychology.*
Martin W. Schein, Sc.D., *Centennial Professor of Biology.*

West Virginia University is a member of the North Central Association of Colleges and Secondary Schools. The University's educational programs are accredited by the North Central Association and by the appropriate accreditation agencies for the professional schools.

Part 1

GENERAL INFORMATION

Opportunity is what West Virginia University is all about — opportunity for people to realize their potential regardless of family income, race, religion, age, sex, national origin, or handicap. Through the educational and cultural opportunities it provides, WVU helps people to find satisfying careers as well as to better understand life and themselves.

This is the unique land-grant tradition to which WVU belongs — one of only 72 such institutions serving the nation, which have been described as “people’s universities for people’s problems.” They are called land-grant institutions because the Congressional act establishing them in 1862 gave federally owned land to each state that then sold the land and used the funds to begin a college which offered programs in agriculture and engineering.

Since its founding in 1867, WVU has developed into a comprehensive university, offering 162 degree programs in 15 schools and colleges, and it has become the center of graduate and professional education, research, and extension programs in West Virginia. It is this intellectual variety and mix that makes WVU an exciting institution with an abundance of options for its 19,000 students on the Morgantown campuses.

Although located in a small city in the Appalachian Mountains, WVU is a cosmopolitan community with students from most of the 49 other states and 65 foreign countries. Many students are from families with modest incomes, with about 35 percent receiving some financial aid. WVU has sent 17 Rhodes Scholars to Oxford University in Great Britain, far more than universities in neighboring states. Two-thirds of WVU’s faculty members have doctoral degrees. They are graduates of 400 American colleges and universities and of 75 foreign institutions.

A variety of off-campus learning experiences are offered students — working in state mental hospitals, with social welfare agencies, and as interns in state government; touring the region with a puppet mobile or performing musical groups; summer overseas programs including foreign language courses in France, West Germany, and Colombia; a semester in the coal-mining region of Wales, England, for social work graduate students; biology and geology courses at the Lake Erie Biological Station and at Wallops Island, Va.; geology classes at the Florida Keys; a U.S. tour in agriculture; and a program in Renaissance and eighteenth-century studies at the Folger Shakespeare Library in Washington, D.C.

West Virginia University provides outstanding facilities for its students and faculty. The growth in physical facilities since 1958 has been equaled by few comparable universities, with more than \$100 million in new buildings having been constructed.

The campuses in Morgantown contain 89 buildings on 800 acres, including libraries with more than a million items and over 7,000 periodical titles.

The WVU Center for Extension and Continuing Education, organized in 1963, has pioneered nationally in broadening the role of the Cooperative Extension Service from strictly agricultural education to include community development. The Extension Center takes educational opportunities to the people through six area centers, offices in the fifty-five West Virginia counties, and graduate centers at Jackson’s Mill, Parkersburg Community College, Potomac State College at Keyser, Shepherd College at Shepherdstown, and at West Liberty State College near Wheeling.

All of WVU's colleges and schools are involved in off-campus programs, which have been recognized nationally for developing new approaches in such fields as rural development, theatre, a master's degree in business administration offered primarily through videotaped and telephone lectures, and the School of Nursing telephone lecture system that connects health centers throughout West Virginia with the WVU Medical Center. WVU-TV, West Virginia's first public television station, broadcasts courses that may be taken for University credit, as well as a variety of cultural and public affairs programs, which reach half of the state's counties.

For research and teaching purposes, WVU operates experiment farms in Hardy, Jefferson, Mason, Monongalia, Monroe, and Preston counties; forests in Greenbrier, Monongalia, Preston, Randolph, and Wetzel counties; a biological station near Terra Alta, Preston County; a geology camp in Greenbrier County; and the State 4-H Camp and a museum of mid-nineteenth century life at Jackson's Mill, which has been designated a national historic landmark (it was the boyhood home of the Confederate General, Stonewall Jackson).

Other WVU branches include the Charleston Division of the Medical Center, the Wheeling Division of the School of Medicine, and Potomac State College at Keyser — West Virginia's only two-year residential junior college.

Potomac State's transfer programs, designed to conform to the WVU lower division, provide the freshman and sophomore years in the liberal arts and sciences as well as pre-professional studies in agriculture, business and economics, computer science, dentistry, education, engineering, engineering of mines, family resources (home economics), journalism, law, medical technology, medicine, music, nursing, pharmacy, physical education, physical therapy, social work, and veterinary medicine. Occupational programs at Potomac State which lead to the Associate in Applied Science degree include: general business, accounting, industrial management, small business administration, agriculture, computer programming, engineering technology, horticulture technology, secretarial studies, and a cooperative program in food management. New certificate programs are in surveying technology assistant, computer equipment operations, and meat processing technology.

Government and Organization of WVU

The West Virginia Board of Regents is vested by law with authority for the control and management of the University and all other state institutions of higher education. Serving on the Board are nine members appointed by the Governor, with advice and consent of the Senate, and three ex-officio members including a faculty member chosen by the Regents' Advisory Council of Faculty and a student named by the Regents' Advisory Council of Students, both of whom vote, and the State Superintendent of Schools. The seven members of the WVU Advisory Board, which include a student, are appointed by the president.

The president, appointed by the Board of Regents, is the chief executive officer of the University as well as its principal academic officer, a role which his position as presiding officer of the University Senate symbolizes.

The University Senate is the vehicle for faculty participation in the governance of the University. It is a legislative body with original jurisdiction over all matters of academic interest and educational policy that concern the entire University or affect more than one college, school, or division. The Senate's decisions are subject to review and approval by the president and the Board of Regents. The Senate includes the president of the University as chairman, provosts, academic

deans, five administrative officers appointed by the president, and senators elected by members of the University Faculty Assembly to represent their colleges and other constituencies. Each constituency is entitled to one senator for each twenty constituents who are members of the University Faculty Assembly. The Senate normally meets once each month.

The *University Faculty Assembly* includes the president as presiding officer, provosts, academic deans, associate deans, professors, associate professors, assistant professors, and instructors holding appointments on a full-time basis. The Assembly normally meets twice a year.

West Virginia University also has a tradition of strong *Student Administration* that touches all aspects of student life and represents student opinion to the administration and faculty. Student Administration has two main branches: the Executive and the Board of Directors (a policy-making group composed of thirteen members which functions in the dual role of a legislative and judicial arm). More than 100 students also serve on 50 University committees including University Senate committees, the Committee on Student Discipline (two student members and three faculty members), and the Mountainlair Advisory Council (four students and four faculty members).

For non-teaching employees, there is the Staff Council, which consists of twelve members elected by their fellow employees in six occupational groups, and International Laborer's Union Local 814, AFL-CIO, which represents many employees.

Morgantown Area

Greater Morgantown has a population of 50,000; Monongalia County, 67,000. Monongalia is one of the largest deep-mine coal-producing counties in the nation, with production exceeding eleven million tons annually. WVU is the largest single employer.

Located on the east bank of the Monongahela River, which flows north to nearby Pittsburgh, Pa., Morgantown is situated on rugged terrain of the Appalachian highlands. The altitude of the city varies from 800 to 1,150 feet above sea level, while the surrounding hills rise eastward to Chestnut Ridge and reach an altitude of 2,600 feet just ten miles from the city.

The area's temperate climate is marked by four distinct seasons of about equal length. Morgantown's valley location allows it to usually escape the extremes of winter — downtown snowfall averages 25 inches annually and cold waves, which average about three a year, are blunted by the hilly terrain. Heavy winter clothing is not usually needed until after Thanksgiving.

Morgantown is served by Greyhound bus and by Allegheny Airlines.

A north-south interstate highway, I-79, is one mile west of Morgantown. U.S. Routes 19 and 119 pass through Morgantown in the north-south direction. U.S. 48, a four-lane, east-west highway, ties I-79 and I-81 together between Morgantown and the Cumberland-Hagerstown, Md., region.

Because of WVU's intellectual resources, the Morgantown area is becoming the major research center in the Appalachian region. Four federal agencies have research facilities in the area—Department of Health, Education and Welfare (Appalachian Laboratory for Occupational Safety and Health), Forest Service (Forestry Sciences Laboratory), Morgantown Energy Research Center of the U.S. Energy Research and Development Administration, and Soil Conservation Service (West Virginia headquarters). The American Association of Cost Engineers and the Society of Explosives Engineers moved their headquarters to Morgantown primarily because of WVU's faculty and facilities.

Two installations add to the area's variety. They are the Robert F. Kennedy Center, a model rehabilitation facility for younger persons who violate federal laws, and an earth-tracking station of the Communications Satellite Corporation at Etam in neighboring Preston County (its 97-foot diameter antenna sends and receives world-wide telephone and other communications from satellites in outer space).

Housing

The University Housing Office, 440 Medical Center Drive (phone 304/293-3621), provides information concerning both University-owned and privately owned off-campus housing.

The University maintains 354 furnished and unfurnished apartments for married students, graduate students, faculty, and staff. Applications for these may be requested by phone or mail.

Listings for privately owned rentals change daily; consequently, students must visit the office to see what is available and to make their own arrangements with landlords. Students are advised to secure living accommodations well in advance of the semester in which they will be enrolled.

The Morgantown housing market has been described as "fairly tight." Because of the hilly terrain, parking also is extremely limited on the WVU campuses and in the city.

WVU Library System

The West Virginia University Libraries contain over 1 million items including more than 850,000 books, 50,000 reels of microfilm, and 600,000 microcards. Some 30,000 volumes are added each year, and over 7,000 periodical titles are received.

The collections are especially strong in the biological sciences, chemistry, engineering, sociology, Africana, the Southern Appalachians, and West Virginia history. Facilities for research in West Virginia and regional history are centered in the West Virginia Collection. In addition to an extensive collection of books, periodicals, and maps, the Collection contains over three million manuscripts. These, together with court records from many counties, are invaluable sources for the study of all aspects of West Virginia history.

The Rare Book Room contains an unusually fine collection of first and limited editions, including the four Shakespeare folios, and the first editions of many of the works of Dickens, Scott, and Clemens.

The Agriculture-Engineering Library on the second floor of the Engineering Sciences Building contains 63,000 volumes. A public card catalog is maintained. In addition, cards for titles in this library are filed in the central Library catalog and are marked "Ag-Eng."

The Physical Sciences Library of 37,000 volumes in the fields of chemistry, geology, physics, and astronomy is in the Chemistry Research Laboratory.

The Medical Center Library on the second floor of the Basic Sciences Building contains 110,000 volumes with a complete public catalog. Author cards for titles in the Medical Center Library appear in the central Library catalog.

The Law Library, with a collection of 104,000 volumes, is in the Law Center on the Evansdale Campus.

The Mathematics Library in Eiesland Hall contains approximately 11,000 volumes.

The Music Library in Room 424A, Creative Arts Center, contains some 17,500 items which include microcards, microfilms, and recordings, as well as books and scores.

The Towers Library is on the main floor of Towers 1. The collection contains approximately 7,000 volumes, for which a public catalog is maintained. The Towers Library acquires a copy of many books on reserve in the central Library, and also contains reference and circulating books, most of which also can be found in the central Library.

The WVU Library, in cooperation with the WVU Foundation, Inc., publishes books primarily of regional interest but occasionally of international scholarly concern (such as the basic historical documents in the *Archives of British History and Culture* series).

Computing Services

West Virginia University is a member of the West Virginia Network for Educational Telecomputing (WVNET). The WVNET computer site, in Morgantown serves as the "host site" for the network and operates two large computers. Computer services are delivered via teleprocessing connections to all the state-supported colleges and universities. The WVNET offices are at 837 Chestnut Ridge Road, directly across from the WVU Medical Center heating plant.

The equipment configuration includes an IBM 360/75 large-scale general purpose electronic digital computer with 1024K bytes of high-speed interleaved IBM 2365 core memory, 1024K bytes of Intermem high-speed memory, and 1024K bytes of IBM 2361 low-speed core storage (LCS); and an IBM 370/148 Computer with 1024K bytes of high-speed memory (providing users with 16 million virtual bytes). The two computer processor units run as a dual system using Shared Spool HASP Peripheral equipment. The system also includes two 3.9 million-byte IBM 2303 magnetic drums; twelve spindles of IBM 3300 Model 11 disk storage; eight spindles of IB M 2314 disk storage; one 7-track, two IBM 2401 9-track, and four IBM 3420 9-track tape drives; six IBM 7340 hypertape drives; two 1100-lines-per-minute IBM 1403 train printers; an IBM 2501 card reader; and an IBM 2540 card reader/punch. An IBM 3705 communications controller serves remote batch and conversational terminals.

Plotting resources include a Tektronix 4002A graphics terminal and a Cal-Comp 563 30-inch digital incremental plotter with Cal-Comp 750 tape drive. Computer output microfilm equipment, presenting an alternative to printed output, includes a Stromberg-Datagraphix 4530 computer output microfilm recorder, a 156 film processor, and a 73 automatic fiche duplicator.

A wide range of programming languages and packages is available. The International Mathematical and Statistics Libraries (IMSL) are supported, as well as the North Carolina State Statistical Analysis System (SAS), the Biomedical package (BMD) developed at UCLA, the University of Chicago's Statistical Package for the Social Sciences (SPSS), Harvard's DATA-TEXT, the WVU Statistical Monitor (SOS). A software guide lists all major holdings and significant subroutines available through the WVNET system.

WVU users access the system through an IBM 1130, one DEC PDP-11/10, one DEC PDP 11/40, and numerous CRT and "hard-copy" conversational terminals.

Services provided by WVU Computing Services personnel include:

Consulting—Program consultants are available at the Stewart Hall site during normal working hours. A statistical consultant is available by appointment during

normal working hours. The consultants are qualified to answer questions concerning system requirements, language specifications, operating procedures, and general programming and data processing considerations. In addition, each consultant has special areas of interest and competence that may be relevant to particular user needs.

Operations—The WVU Stewart Hall and Engineering Sciences Building sites are open from 8 a.m. to 12 midnight. Operators assist users with data input and maintain control of user printouts for students, faculty, and researchers.

Programming—A large programming and analysis staff produces specialized programs and procedures for all offices of the University. These services include maintenance of a Data Dictionary, special reporting, and production of permanent programs and documentation.

Production—Skilled data entry personnel are available to enter large volumes of data into IBM 3741/2's for transmission to WVNET. Additional personnel monitor production systems (e.g., payroll, ledger, etc.) for all University offices. The production staff expedites all WVU financial data, student records, etc.

Test Scoring—Optical page reader test scoring is available to all WVU faculty and staff members. This service is available through the Production Services unit.

Request for additional information or questions should be directed to the WVU Director of Computing Services.

Veterans

Information regarding educational opportunities made possible at WVU through provisions of the Veterans Readjustment Benefits Act of 1966 — G.I. Bill (Public Law 358), the Vocational Rehabilitation Program of the Veterans Administration (Public Law 634) may be obtained from the Veterans Counselor by personal conference at his office in Mountainlair or by mail. An Amendment to Public Law 634 enacted in 1964, provides benefits to many dependents of 100 percent disabled veterans.

Foreign Students

All new foreign students must contact the Foreign Student Office in Moore Hall when they first arrive. The Foreign Student Adviser is available for guidance and counseling. Foreign students are encouraged to join the International Students' Association, an organization of foreign and American students interested in international relations. They also are encouraged to join their particular nationality organizations. The Host Family Program provides foreign students an opportunity to meet and become acquainted with American families and visit in their homes.

All inquiries and applications from foreign students must be sent to the Dean of Admissions and Records. The "Test of English As a Foreign Language" (TOEFL) must be taken by all foreign students before they can be admitted to WVU.

(For admission information concerning foreign students, see page 23.)

Degree Programs Offered by WVU

College of Agriculture and Forestry

Major or Degree Program	Bachelor	Master	Doctorate
Agricultural Biochemistry		M.S.	Ph.D.
Agricultural Economics		M.S.	
Agricultural Education	B.S. Agr	M.S.	
Agricultural Microbiology			Ph.D.
Agriculture		M. Agr.	
Agronomy		M.S.	Ph.D.
Animal Nutrition			Ph.D.
Animal Science		M.S.	
Animal and Veterinary Sciences	B.S., B.S. Agr.		
Forest Resources Management	B.S.F.		
Forest Resources Science			Ph.D.
Forestry		M.S.F.	
Horticulture		M.S.	
Landscape Architecture	B.S.L.A.		
Plant Pathology		M.S.	Ph.D.
Plant and Soil Sciences	B.S. Agr.		
Recreation	B.S.R.	M.S.	
Resource Management	B.S., B.S. Agr.		
Wildlife Management		M.S.	
Wildlife Resources	B.S.		
Wood Industries	B.S.F.		

College of Arts and Sciences

Biology	B.A.	M.S.	Ph.D.
Chemistry	B.A., B.S.	M.S.	Ph.D.
Computer Science	B.S.	M.S.	
Economics	B.A.		
English	B.A.	M.A.	Ph.D.
Foreign Languages	B.A.	M.A.	
Geography	B.A.		
Geology	B.A., B.S.	M.S.	Ph.D.
History	B.A.	M.A.	Ph.D.
Interdepartmental Studies	B.A.		
Mathematics	B.A.	M.S.	
Philosophy	B.A.		
Physics	B.S.	M.S.	Ph.D.
Political Science	B.A.	M.A.	Ph.D.
Public Administration		M.P.A.	
Psychology	B.A.	M.A.	Ph.D.
Sociology	B.A.	M.A.	
Speech Communication	B.A.	M.A.	
Statistics	B.S.	M.S.	

Board of Regents Bachelor of Arts Degree

(Intended for older students who wish to resume and complete their college studies. Detailed information available from the Coordinator, Board of Regents B.A. Degree Program, Student Services Center, West Virginia University, Morgantown, WV 26506.)

College of Business and Economics

Accounting	B.S.B.Ad.		
Business Administration		M.B.A.	
Business Management	B.S.B.Ad.		
Economics	B.S.	M.A.	Ph.D.
Finance	B.S.B.Ad.		
Industrial Relations		M.S.	
Marketing	B.S.B.Ad.		

Creative Arts Center

Art	B.A.	M.A.	
Music	B.M.	M.M.	D.M.A., Ph.D., Ed.D.
Theatre	B.F.A.	M.A.	
Visual Art	B.F.A.	M.F.A.	

School of Dentistry

Dental Hygiene	B.S.		
Dentistry			D.D.S.
Orthodontics		M.S.	

College of Engineering

Engineering		M.S.E.	Ph.D.
Aerospace Engineering	B.S.A.E.	M.S.A.E.	
Chemical Engineering	B.S.Ch.E.	M.S.Ch.E.	
Civil Engineering	B.S.C.E.	M.S.C.E.	
Electrical Engineering	B.S.E.E.	M.S.E.E.	
Industrial Engineering	B.S.I.E.	M.S.I.E.	
Mechanical Engineering	B.S.M.E.	M.S.M.E.	

College of Human Resources and Education

Education			C.A.S., Ed.D.
Counseling and Guidance	M.A.		
Education Administration	M.A.		
Educational Psychology	M.A.		
Elementary Education	B.S.E.Ed.	M.A.	
Family Resources	B.S.	M.S.	
Reading	M.A.		
Rehabilitation Counseling	M.S.		
Secondary Education	B.S.S.Ed.	M.A.	
Special Education	M.A.		
Speech Pathology and Audiology	B.S.	M.S.	

Interdisciplinary Programs

Genetics and Developmental Biology	M.S.		Ph.D.
Reproductive Physiology	M.S.		Ph.D.

School of Journalism

Journalism	B.S.J.	M.S.J.	
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College of Law

Law			J.D.
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School of Medicine

Anatomy	M.S.		Ph.D.
Biochemistry (Medical)	M.S.		Ph.D.
Medical Technology	B.S.	M.S.	
Medicine			M.D.
Microbiology	M.S.		Ph.D.
Pharmacology	M.S.		Ph.D.
Physical Therapy	B.S.		
Physiology and Biophysics	M.S.		Ph.D.

College of Mineral and Energy Resources

Engineering in cooperation with College of Engineering			Ph.D.
Engineering of Mines	B.S.E.M.	M.S.E.M.	
Mineral and Energy Resources		M.S.	
Mineral Processing Engineering	B.S.		
Petroleum Engineering	B.S.Pet.E.	M.S.Pet.E.	

School of Nursing

Nursing	B.S.	M.S.N.	
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School of Pharmacy

Pharmaceutical Sciences	M.S.
Pharmacy	B.S.

School of Physical Education

Education	Ed.D.
Education in cooperation with Human Resources and Education	C.A.S.
Physical Education	B.S.P.E.....M.S.
Physical Education Interdisciplinary ...	B.S.P.E.
Safety Studies	M.S.

School of Social Work

Social Work	B.S.W. M.S.W.
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Academic Common Market

West Virginia provides its residents opportunity, through the Academic Common Market and through contract programs, to pursue academic programs not available within the state. Both programs permit West Virginians to enter out-of-state institutions at reduced tuition rates.

Contract programs have been established for study in veterinary medicine, optometry, architecture, and podiatry; and the Academic Common Market provides access to numerous graduate programs. The programs are restricted to West Virginia residents who have been accepted for admission to one of the specific programs at designated out-of-state institutions.

Through reciprocal agreement West Virginia University allows residents of states within the Academic Common Market to enroll in specific graduate programs on an in-state tuition basis.

Further information may be obtained through the Graduate Dean. In each case application must be made through the higher education authority of the state of residence. For West Virginia residents this is the West Virginia Board of Regents, 950 Kanawha Boulevard, East, Charleston, WV 25301.

Part 2

ACADEMIC INFORMATION

The Graduate School, as distinct from the other colleges and schools, is University-wide, drawing together all the University's faculties and students concerned with graduate study. The Graduate Faculty is empowered to establish policies and regulations covering: the introduction of degree programs; degree, curricular, thesis, and dissertation requirements; standards of student scholarship; residency rules, etc.; and these policies and regulations take precedence over those of particular colleges, schools, and departments.

All decisions on major policies and regulations which affect the introduction of new degree programs and graduate study in general are based on recommendations made by the Graduate Faculty, after study and advice by the Executive Committee of the Graduate Faculty and the Dean of the Graduate School.

Nominations for membership in the Graduate Faculty are made by the chairperson of the graduate degree program or programs with which the faculty member will be concerned; and are acted upon by the Graduate School Executive Committee. An explanation of the criteria and guidelines for the membership policy which has been established by vote of the Graduate Faculty accompanies the nomination form, obtainable from the Graduate School Office, and is to be consulted by both the nominee and the chairperson before they complete the form. No candidate for a degree at WVU may be named to the Graduate Faculty.

Members and Associate Members are entitled to the same voting privileges and to participate fully in the proceedings of the Graduate Faculty. The only difference between the two statuses is that Members are authorized to direct doctoral research, while Associate Members are authorized to direct master's thesis research but not doctoral research. The status of Associate Member is indicated in the listing of the Graduate Faculty (Part 5 of this *Catalog*) by an asterisk (*) after the name.

The Executive Committee consists of the Dean of the Graduate School, ex officio, and nine Graduate Faculty members elected at large by the Graduate Faculty for staggered terms of three years. No more than one member may be elected from any one school or college. The Executive Committee normally meets once a month and calls meetings of the Graduate Faculty twice during the academic year.

In practice, much of the day-to-day administration of graduate study is conducted by the chairpersons or graduate advisers responsible for the particular programs. At the University level, responsibility for administering the graduate faculty's policies and regulations, resolving problems of interpretation of these rules, keeping student records, and preparing graduation lists is vested in the Dean of the Graduate School.

Graduate School Executive Committee

Stanley Wearden, Ph.D., (ex officio), *Dean (Chairman)*.

James B. Blair, Ph.D., *Associate Professor of Biochemistry*.

Linda Butler, Ph.D., *Professor of Entomology*.

Edward F. Byars, Ph.D., *Professor of Mechanical Engineering and Mechanics*.

Urban Couch, M.F.A., *Professor of Art*

Thomas S. Isaack, D.B.A., *Professor of Management*.

Robert L. Kurucz, Ph.D., *Professor of Physical Education.*
Carl J. Malanga, Ph.D., *Associate Professor of Pharmacy.*
John J. Renton, Ph.D., *Professor of Geology.*
Duane R. Skidmore, Ph.D., *Professor of Mineral and Energy Resources.*

Application and Admission to Graduate Programs

No one is admitted to the Graduate School who does not hold a bachelor's degree from an accredited institution.

Students wishing to take off-campus courses (see page 30) for graduate credit must first be admitted to the Graduate School through the same procedures as for on-campus study, as specified in the material which follows.

Application

Prospective graduate students are urged to initiate application for admission as early as possible, January being none too early for admission the following fall semester. The first step of a student interested in a degree program should be to ask for information from the department, division, school, or college offering the program desired; the reply to such an inquiry will include instructions for applying to the particular program.

In all cases, application must be made for admission to the Graduate School, on standard forms provided by the Office of Admissions and Records. The completed form is to be returned to the Office of Admissions and Records, not to the Graduate School office, and must be accompanied, on first application, by payment of a nonrefundable special service fee of \$10.00. Applicants must at the same time request the registrar or records office of the college of their baccalaureate degree to send an official transcript directly to the Office of Admissions and Records. If other institutions have been attended in the course of undergraduate or graduate study, transcripts should be requested from them as well. Application and transcripts should be received at least one month before General Registration.

The \$10.00 service fee is required only once. In the case of any subsequent application for admission to the WVU Graduate School there is no service fee.

The occasional student who enrolls for a second bachelor's degree is not under the jurisdiction of the Graduate School but rather under that of the school or college which offers the baccalaureate degree program. Any student with a bachelor's degree who wishes to be given graduate credit for any course numbered 200 or higher must have been admitted to the Graduate School *before* enrollment in the course or courses concerned, making application as indicated above.

Kinds of Application

Degree Program

Applicants usually apply for admission to a degree program simultaneously with admission to the Graduate School. If the applicant meets the minimum admission requirements of the Graduate School, a copy of the application is forwarded to the faculty of the program of interest. Any graduate degree program is permitted to set admission requirements which go beyond the minimum admission standards of the Graduate School. No one can pursue an advanced degree at WVU unless admitted to the appropriate degree program.

Special Student

Some applicants wish to take graduate course work but not to pursue an advanced degree. Others may meet admission requirements but be uncertain about the program which would best suit their career goals. Such students are advised to seek admission as Special Students. To insure proper advising, all applicants for special admission are interviewed by the Graduate School. However, if time or distance makes such an interview impractical, it may be replaced by a letter detailing the applicant's academic background and experiences, career goals, and expectations for graduate study.

Classification on Admission to Graduate School

The Office of Admissions and Records will notify the applicant of the actions taken. A completed admission is in one of four categories:

1. *Regular Graduate Student*—one who is approved for a degree program.
2. *Regular with Deficiencies*—one who is approved for a degree program but has certain deficiencies to be made up by course work.
3. *Special Graduate Student*—one who would qualify for Regular status but is not pursuing a degree program.
4. *Special-Provisional*—one who because of undergraduate record or late application cannot be immediately approved for a degree program or the *Special* category.

Admission Based on Undergraduate Performance

To be classified as a *Regular Graduate Student*, the applicant must have had an undergraduate grade-point average of at least 2.5 (A equals 4.0), have been accepted into a graduate degree program according to the criteria established for that program, and be under no requirement to make up course deficiencies; the program must have received the applicant's records and have named an adviser.

The applicant is classified as *Regular with Deficiencies* if all the above conditions have been met except that there are course deficiencies to be made up.

To be a *Special Graduate Student* the applicant must also have an undergraduate grade-point average of at least 2.5; this is then the class for students who have not entered a degree program.

The applicant is classified as a *Special-Provisional Graduate Student* (1) when the application for admission has not been supported by official transcripts at the time of registration and/or (2) when, although a graduate of an accredited institution, the applicant presents an undergraduate grade-point average of less than 2.5.

Admission Based on Prior Graduate Study

The same four categories apply as well to those who have undertaken previous graduate study. In general, the cumulative grade-point average regulations apply to any transfer student who has not completed a graduate degree. However, an applicant having received a master's degree from an accredited college or university may be admitted to whatever category is deemed most appropriate by the faculty of the program of interest.

Reclassification of Status

A student, particularly one with a *Special* or *Special-Provisional* status, may later seek reclassification. Reclassification can be gained as follows:

1. From *Special-Provisional*

The *Special-Provisional* is a transitional category which permits the Graduate School to admit provisionally an applicant who does not satisfy the admission requirements at time of registration: admission materials may not yet have been received and processed, and/or the student's recent records show promise that appears to offset poor academic performance earlier. A student in the *Special-Provisional* category is required to seek reclassification by the time 9 to 12 semester hours of course work have been completed.

- a. to *Special* category.

This reclassification is possible if all entrance procedures have been completed and all other conditions of *Special* status have been met; i.e., the undergraduate grade-point average was at least 2.5; or if not, any special conditions stated in the letter of admission have been met and/or the student has maintained a cumulative grade-point average of at least 2.25 in graduate course work taken at WVU.

This reclassification can be initiated by the student at the Graduate School Office.

- b. To *Regular* (degree program) categories

This reclassification is possible if the conditions for admission as a *Regular* student (either category) are met and/or a cumulative grade-point average of at least 2.75 has been maintained in graduate course work taken at WVU.

2. From *Special* to *Regular*

Students who had not originally intended to seek a graduate degree often change their minds after experiencing the stimulation of graduate course work. Reclassification is possible if the minimum graduate grade-point average of 2.75 has been maintained and the other conditions of the appropriate graduate program are met.

For any reclassification to *Regular* status there must be the approval and the petition of the graduate faculty of the program admitting the student.

Petitions by Seniors for Graduate Credit

WVU students (and those in colleges where WVU offers off-campus course work) who are within 12 semester hours of graduation may petition the Graduate School to be allowed to enroll for courses for which they may receive graduate credit *after* obtaining the baccalaureate and being admitted to the Graduate School. Such students must have a grade-point average of at least 2.5. Furthermore, the course work may not be counted for both undergraduate and graduate credit, and the petition must have been approved before or at the time of enrollment.

The maximum amount of graduate credit permitted under this regulation is 15 hours. Combined graduate and undergraduate credit must not exceed 18 hours in one semester or 12 hours in the summer.

Petition forms for this purpose may be obtained at the Graduate School Office.

Special Admission Requirements of Some Programs

Programs may establish admission requirements in addition to those set by the Graduate School, such as the submission of scores on standardized tests, and the receipt of letters of recommendation.

Graduate Record and Other Examinations

Many programs at WVU require Graduate Record Examination (GRE) scores from all applicants, but in no program are they the sole criterion for admission. Some programs require both the general aptitude and the appropriate advanced test before considering an applicant for admission. Other programs require different tests, such as the Miller's Analogy. The admission requirements for each program are found in Part 4 of this *Catalog*.

Students should arrange to take the tests required for their prospective graduate majors before enrollment in the Graduate School. If GRE tests are required, the applicant should request the Educational Testing Service to forward scores to the WVU program concerned.

Those planning to take the GRE must mail completed forms so they reach the Educational Testing Service, Princeton, NJ 08540, at least eighteen days before the date of the examination. The forms and examination dates are a part of the GRE information packet available at the WVU Graduate School office or at other college centers throughout the country. The fee for each of the examinations (aptitude and advanced) is, for 1977-78 (as this goes to press), \$13.00.

Information about the Miller's Analogy test may be obtained from the psychology department of the applicant's undergraduate institution.

Admission of Foreign Students

Foreign students wishing to enroll in the WVU Graduate School must comply with the academic requirements for admission which have already been stated and with certain additional academic and non-academic requirements as follows.

Early Inquiry and Application

Foreign applicants should forward a letter of inquiry one year before the intended time of beginning study in the United States. Foreign students admitted are expected on campus at the beginning of July for a six-week period of orientation and intensive study of English. Accordingly, all the papers on which admission is based must have been received at the University at the very latest by April first, to allow sufficient time for their processing and the communication of the decision to the student, as well as for the student to make arrangements for passport and visa clearance and other necessary details.

Foreign students should make all arrangements for their financial obligations to WVU for their entire stay in the United States before leaving their country.

English Proficiency

No person should undertake study at WVU who is not competent in the use of English. All foreign applicants the language of whose family and schooling was other than English must present a composite score of at least 500 on the "Test of English As a Foreign Language" (TOEFL). Some graduate degree programs

require a considerably higher score on this test. Information on locations of TOEFL testing centers, dates of testing, and application forms is available from the Educational Testing Service, Princeton, NJ 08540, USA. Tests are normally given four times each year. It usually requires about one month to score and report individual test results. Registration for the TOEFL examination closes five weeks before the testing date.

Credentials

Complete and original official records of all studies undertaken by an applicant at any institution attended (secondary school, college, university, technical school, professional school, etc.), must be provided at time of application for admission to WVU. Records may be copies, provided they are officially stamped. The records must show evidence of the study the applicant has done in the field of intended study at WVU.

Such records should include: (1) complete dates of attendance; (2) identification of individual subjects; (3) total number of hours in each class per week; (4) total number of weeks each class has in session; (5) final grade in each subject, for each year; (6) actual credits earned for each subject; (7) class, division or rank achieved; (8) identification of individual; (9) description and clarification of each institution grading system; and (10) certification, and date, of degree or awards achieved, if not a part of the mark sheet or transcript. If any of this information cannot be supplied, an official explanatory statement from the school should be submitted. (All documents must be in English.)

All documents should be forwarded directly from the Registrar or other authorized official of the school to the WVU Office of Admissions and Records.

If an applicant is currently enrolled in a school, tentative admission may be granted on the basis of an incomplete record which indicates the applicant will unquestionably meet the admission standards of WVU. Final admission, however, cannot be approved until the complete record has been received and evaluated.

Foreign Students Transferring Within the U.S.

Foreign students applying to transfer from schools within the United States are advised that they will not be admitted and permitted to register at WVU unless they have complied well in advance with all requirements of the United States Immigration and Naturalization Service (INS).

The school the student was last authorized to attend must have completed and signed the INS form I-538. This, together with a valid I-20 form received from WVU must have been submitted to the INS office having jurisdiction over the school the student was last authorized to attend. If the student is not now attending that school, a letter must be added explaining in detail why.

If the INS approves the transfer, this approval will be stamped on the student's I-94. The student must then immediately notify WVU that the transfer has been approved, either by sending an INS statement of transfer approval, or simply by reporting the fact that the approval appears on the I-94.

Only when these procedures have been completed will WVU undertake to admit and register the student. No student should move to Morgantown without having received this assurance of admission from WVU.

Graduate Study

Graduate Adviser

Each academic unit through which graduate degree programs are administered has one or more graduate advisers, and each entering graduate student is assigned an adviser at time of admission or shortly thereafter. Adviser and student should meet prior to first enrollment and begin to formulate a plan of study.

Contractual Nature of Graduate Study

Graduate study at WVU can be compared to a series of contractual arrangements between the student and the graduate faculty of the University. The student's rights, privileges, obligations, and responsibilities are contained in these. These contracts, or documents, are the *Graduate School Catalog*, the plan of study, and, if research is one of the degree program requirements, the prospectus.

Graduate Catalog

The *Graduate Catalog* (1974-75 to 1977-78) or *Graduate School Catalog* (to 1973-74, and from 1978-79) which is in effect when a student begins work toward an advanced degree constitutes an agreement between the student and the Graduate School of WVU. Acceptance by the University and enrollment on the part of the student signify the willingness of each party to abide by all the conditions stated in the *Catalog*.

If there are major changes in the *Catalog* during the course of a student's studies, the student does not have to abide by them unless they are promulgated by the Board of Regents or by local, state, or federal law. However, by choice and with the approval of adviser, committee (if appointed), and Graduate School, a student may make a "change in *Catalog*" and agree to meet *all the conditions* of the *Catalog* of a later year.

Plan of Study

Shortly after entrance into a degree program and usually before 9 to 12 hours of graduate course work have been completed, a meeting is held among student, adviser, and committee (if appointed) to draw up a plan of study. Depending on degree sought and field of study, the plan may also contain the outline of the research problem to be undertaken. Some graduate programs have student and committee meet at a later date to delineate the research project more formally as a *prospectus* for the report, thesis, or dissertation.

The plan of study is subject to approval by the Dean of the Graduate School and is made a part of the student's record. It then becomes a formal agreement between student and program faculty as to the conditions which must be met for completion of the degree requirements. Any subsequent changes in plan of study (or prospectus) can be made only through mutual agreement and with Graduate School approval.

When the binding nature of these documents is fully understood, there is less likelihood that later misunderstanding will arise. Thus anyone who contemplates application to the Graduate School at WVU is urged to read this *Catalog* carefully and request clarification where needed. A student must be very aware of the right to express personal views in the drafting of the plan of study and/or research

prospectus. Should disagreement arise at any time, the responsibility for arbitration rests with the Graduate School Appeals Committee and the Graduate Dean.

Candidacy

Admission to candidacy for any graduate is an additional requirement over and above admission to the Graduate School and admission to a graduate program in a particular department, school, or college. A candidate for a graduate degree is a student who has been officially admitted to the Graduate School and to a graduate program and has satisfactorily completed a suitable period of graduate work in residence as a regular graduate student in which ability to do work of graduate caliber is demonstrated to the satisfaction of the student's adviser and graduate committee. In doctoral programs and in some master's programs it is established by successful completion of departmental qualifying, comprehensive, and/or candidacy examinations as further explained in the following pages under requirements for the doctor's degree, and in Part 4 of this *Catalog*.

Scholarship

Grading

Because of their familiarity to most students, letter grades are assigned in many graduate courses. However, better than "average" performance is expected of graduate students. They are enrolled for fewer credit hours than they were as undergraduates, 9 to 12 hours being the norm for a full-time graduate student, and are expected to spend more time on each course and achieve better than average mastery of the material. A few grades of C can be tolerated in graduate programs provided there are higher grades in other courses to compensate for them. However, a grade of C is considered average performance for an undergraduate student and not for one who is studying for an advanced degree.

A — excellent (given only to students of superior ability and attainment)

B — good (given only to students who are well above average, but not in the highest group)

C — fair (average for undergraduate students)

D — poor but passing (cannot be counted for graduate degree credit)

F — failure

I — incomplete

W — withdrawal before the date specified in the University Calendar for the semester or session of the student's enrollment in the course, or withdrawal doing satisfactory work thereafter

WU — withdrawal (doing satisfactory work after the specified date)

X — auditor (no grade and no credit)

S — satisfactory

U — unsatisfactory (equivalent to D or F)

(Pass/Fail grading is not applicable to graduate course work.)

Credit Limitations

General

Credit toward a graduate degree may be obtained only for courses listed in the *Graduate Catalog*, and numbered 200-499, in which the grade earned is A, B, C,

or S. No courses in which the grade earned is D, F, or U can be counted toward a graduate degree.

Graduate students may not take any 200-, 300-, or 400-level course on a pass/fail basis; P/F grading applies only to undergraduate course work. Certain graduate-level courses, on the other hand, are designated to be graded S (Satisfactory) or U (Unsatisfactory), a designation which has been approved for the specific course by the Dean of the Graduate School and applies to all students in the course. Courses in which the students are graded S or U are so identified in the *Catalog*.

No residence credit will be allowed for special field assignments or other work taken off the WVU campus without prior approval by the Dean of the Graduate School. No more than 40 percent of course credits counted toward meeting requirements of any graduate degree may be at the 200 level.

Maximum Course Load

No more than 15 hours of graduate courses in any one semester may be carried by a student. During the summer no more than 12 credits may be earned in the total of the two summer enrollment periods.

Transfer Credit

The Graduate School requirement for the master's degree at WVU consists of earning no fewer than 30 hours of graduate credit including at least 18 hours taken at WVU. For programs which require more than 30 hours, 60 percent of the course work is expected to be of WVU origin. Graduate courses taken elsewhere will not be approved for transfer credit unless the written approval of the Dean of the Graduate School was secured before enrolling in them. Such transfer credit, to be approved, must meet requirements for a continuous and unified program of graduate study.

Employed Graduate Students

Graduate students will be required by their advisers to limit their credit loads in proportion to the outside service rendered and the time available for graduate study. In general, persons in full-time service to the University, or other employer, will be advised to enroll for no more than 6 hours of work in any one semester and those in half-time service for no more than 12 hours. Maximum credit loads may be less for employed graduate students in some academic colleges, schools, and departments.

Maximum Time for Completion

Completion of requirements for any graduate degree must be accomplished within a period of seven years. For a master's degree the period starts at the initial enrollment for graduate credit. The same is true for a doctoral degree, although when there is an intervening award of a master's degree the seven-year period for completion of the doctorate starts at the initial enrollment for a graduate course after the master's degree is conferred. Credits lost at the beginning of a graduate program under this regulation will not usually be considered for revalidation and then only upon formal petition to the Dean of the Graduate School by the student's graduate adviser or committee chairperson showing a completion program which the student must meet.

Grade-Point Average

The grade-point average is computed on all work for which the student has registered while in the Graduate School except for courses with grades of I, W, WU, and X, and is based on the following grade-point values:

A	B	C	D	F	U
4	3	2	1	0	0

When a student receives a grade of I and later removes the incomplete grade, the grade-point average is then recalculated on the basis of the new grade.

The grade of I is given when the instructor believes the course work is unavoidably incomplete or that a supplementary examination is justifiable. The grade of I must be removed before any graduate degree can be awarded, either by removal of the incomplete or by having it recorded as a *permanent incomplete*. Only the instructor who recorded the I, or, if the instructor is no longer at WVU, the chairperson of the unit in which the course was given, may initiate either of these actions.

In the case of withdrawal from the University, any I grade remains on the student's record as I.

Probation and Suspension

Probation. A *Regular* (degree program) graduate student whose grade-point average falls below 2.75 after the first 9 hours of graduate study is not in good standing and will be placed on probation. A *Special* graduate student is not in good standing and will be placed on probation if a 2.25 average is not maintained after a similar period of enrollment. A student on probation is required to achieve the average necessary for good standing in the next enrollment period (or, in the case of a part-time graduate student, in the next 9 hours of course work).

Suspension. If the required average is not attained, the student will be suspended; that is, will not be allowed to continue in the Graduate School. Additionally, a student failing one-half or more of the course work taken during any enrollment period will be suspended.

The above are minimum standards for the entire Graduate School; a graduate program may set higher standards which the student must also meet.

A student who has not been properly admitted or who has been suspended from a program may not further enroll. If registration for course work is attempted, the University can cancel the enrollment.

Credit hours for courses in which the grade is lower than C will not count toward satisfying graduate degree requirements.

Ethics of Scholarship

Students enrolled in the Graduate School are expected, like the faculty, to adhere to the methods of rigorous scholarship and to the *ethics* which characterize sound scholarship. It is particularly grave for a *graduate* student to transgress the ethics of scholarship, since the student's presumed purposes in Graduate School are to master aspects of the method and content of a discipline and to prepare for a professional role.

The term plagiarism is an important one in all scholarly endeavor, and needs to be clearly understood by all scholars. It is plagiarism to steal and pass off as one's own the ideas or words of another; it is therefore plagiarism to present as one's own an idea derived from an existing source. These are the straightforward

definitions provided by *Webster's Seventh New Collegiate Dictionary*. A student under some doubt as to whether a particular instance might constitute plagiarism should request the help and clarification of the faculty member under whom the work is being done.

The Graduate School's policy and procedural rules for handling cases of alleged plagiarism or other cheating offenses are designed to provide due process and protect students from miscarriage of justice, and to protect the University community from the degrading effects of unpunished dishonesty in academic work.

Procedural Rules for Handling Cheating/Plagiarism

At the discretion of the instructor or the chairperson of the department, some cases involving cheating violations by graduate students may be resolved satisfactorily at these levels. Other instances of alleged or suspected cheating by students enrolled in the Graduate School may be reported to the Dean of the Graduate School by the chairperson of the department.

A student who is accused of cheating has the right to defend against the accusation. If the student admits guilt in a signed statement, the Dean of the Graduate School shall prescribe or, in case of suspension or expulsion, recommend to the President of WVU the penalty which in the Dean's judgment is appropriate under the circumstances. A student who denies guilt is entitled to a hearing before the Graduate School Appeals Committee. If the Appeals Committee finds the student guilty, it may recommend the penalty it deems appropriate under the circumstances to the Dean of the Graduate School who may accept the recommendation or recommend to the President a more severe or a less severe penalty when in his judgment it is warranted. The allowable penalties for cheating include an assigned grade of "F" on the examination or work at issue, an assigned grade of "F" in the course involved, suspension (with the right to apply for readmission after a specified interval), and expulsion.

The student may appeal to the President of the University any and all decisions of the Dean in accordance with standard operating procedures as spelled out in the President's statement on due process of January 29, 1971. Appeals in regard to decisions made by the University President may be taken to the Board of Regents.

If a student admits, in writing, having been guilty of cheating, or is found guilty of cheating by the Graduate School Appeals Committee in a case involving what is believed to be a criminal offense — such as theft of examination or text materials, alteration of records, breaking or entering buildings, offices, desks, safes or filing cabinets, damage to public property and other similar misconduct — the academic penalties and discipline as herein prescribed shall be applied. In addition thereto, the dean of the college or school concerned shall, with the approval of the President, cause the facts of the case to be presented to the appropriate prosecuting attorney for further investigation and for such criminal or other action as may be warranted.

Absences

Students and faculty have together formulated the University's policy on absences from classes, which spells out the responsibilities of student and instructor as follows:

The student who is absent from class for any reason is responsible for work missed. Students should understand that absences may jeopardize their grades or

continuance in the course. Instructors who use absence records in the determination of grades must announce this fact to students (in writing) within the first five class meetings. It is the responsibility of the instructor to keep an accurate record of all students enrolled. Instructors may report excessive absences to the student's dean or adviser. Students who have been absent because of illness, authorized University activities, or for other valid reasons, are to have the opportunity to make up regularly scheduled examinations.

As matter of good manners, a student should inform an instructor in advance if obliged to be absent from a class meeting.

Withdrawals

Withdrawals are of two sorts: withdrawal from some part of the work for which registered, and withdrawal from the University. Unless the formal withdrawal procedures are completed, failing grades are recorded. All withdrawals must have the initial approval of the student's adviser. It is the student's responsibility to see that all forms are properly executed and delivered to the appropriate authorities for recording.

Partial Withdrawal

In a given semester or summer session a student may, with the adviser's approval and until the date specified in the current University Calendar, withdraw from part of the course work in which enrolled, and the grade for a course so dropped is recorded as W. Withdrawal from some part of one's course load after the specified date is permitted only after approval of the adviser and the Graduate Dean, and only up until a second date specified in the prevailing University Calendar; the grade to be recorded is then either W or WU: W if the work in the course has been satisfactory, WU if it has been unsatisfactory. In determining probation or suspension a WU is considered to be an F. No withdrawal from a part of the course load is permitted after the second specified date.

The University Calendar is printed in the prevailing *Schedule of Courses*, and the last dates for withdrawal procedures should be carefully noted at time of enrollment, particularly in the summer, when the prescribed periods are considerably shorter.

Withdrawal from the University

A student who desires to withdraw from the University must obtain a withdrawal form from the Office of Admissions and Records (or dean's office of an off-campus instructional unit). The withdrawal procedure, which will be explained at that time, must begin with the approval of the student's adviser.

Off-Campus Graduate Study

The Center for Extension and Continuing Education conducts five WVU graduate centers located at Jackson's Mill, Parkersburg Community College, Potomac State College, Shepherd College, and West Liberty State College. Under the administration of the Division Leader for Off-Campus Credit Programs, approximately 130 graduate-level off-campus courses are offered each semester and are designed to enable students to fulfill the requirements of specified master's degree programs.

Master's programs available through the centers are reading, secondary classroom teacher, education administration, elementary classroom teacher, business administration, and safety studies. Courses offered are approved by the appropriate department chairperson and academic dean, by the Division Leader, and by the Dean of the Graduate School.

Students wishing to take off-campus courses for graduate credit must first be admitted to the Graduate School through the same procedures as for on-campus study, as specified under "Application and Admission" (page 20). It is the responsibility of students to ascertain from the appropriate college and department the specific requirements for degree candidacy.

Advising and scholarship standards are the same for both on-campus and off-campus study.

Library Resources

Library and laboratory facilities for off-campus courses must be approved by the Division Leader for Off-Campus Credit Programs and, in case of courses for graduate credit, by the Graduate School Dean. Books for use by off-campus students may be borrowed from the WVU Library upon the order of the Division Leader for Off-Campus Credit Programs, subject to the approval of the Library Committee. Postal charges must be paid by the individual or groups for whom the books are borrowed.

Full-Time and Part-Time Students

A student is classified as either full-time or part-time in any given enrollment period. In the Graduate School a student is classified as full-time if enrolled for as much as 9 hours in a semester or as much as 6 hours altogether in the summer.

Registration Requirement

Even if the graduate student does not wish to enroll in course work but is simply making use of University library and research facilities, consulting with graduate committee members, or anticipating final examination, it is necessary to have such student enrolled for at least 1 hour of graduate credit. In no other way can the University receive credit for its contribution to graduate study, attest to student status, or guarantee the protection to which the student is entitled. A student may not take the final examination or complete other conditions for graduation unless duly enrolled.

A minimal registration fee of \$1.00 is payable by the student who is to graduate while not in residence. If a student not in residence and not making use of any University facilities is to return simply to take the final examination for a degree, the adviser should address a letter to the Graduate Dean, explaining these facts and asking that for this student, who must be registered in order to be graduated, all tuition and fees be waived except for the \$1.00 fee. If the request is approved by the Dean, it will be returned with the approval signature to the adviser, who will then see that it is presented at the Office of Admissions and Records by the student or by a member of the same department at least two weeks before the end of the semester in which the degree is to be awarded.

Theses and Dissertations: Procedural Rules

Theses and dissertations must be presented to the student's graduate adviser or committee chairperson at least one month for master's candidates and two months for doctoral candidates before the end of the enrollment period in which completion of all requirements is expected. The form prescribed under the Graduate School "Regulations Governing the Preparation of Dissertations and Theses" must be followed with the guidance of the student's graduate adviser or the chairperson of the student's committee. For the manuscript to be approved there must be no more than one unfavorable vote among members of the student's committee. Two accepted copies in approved typewritten form (master's theses in bound form and doctoral dissertations unbound) must be delivered to the Graduate School office at least one week before the close of the period in which the degree is expected to be completed (one week before the end of the second summer session, one week before the end of the final examination period at the end of the first semester, or one week before Commencement Day at the end of the second semester). Additional regulations are described under specific degree requirements in the following pages, and in the "Information and Check List for Master's Candidates," a corresponding leaflet for doctoral candidates, and one for adviser or committee chairperson, available at the Graduate School office. Problem reports are deposited with the major department in the form and by the dates the department requires.

The WVU Office of Publications provides service to graduate students in the preparation of multiple copies of master's theses and doctoral dissertations. Following are some of the guidelines concerning the services offered:

1. Students must furnish a neatly typewritten manuscript of the text with all pages numbered and collated in conformity with the regulations of the Graduate School. The use of carbon ribbons on typewriters will produce neater copies of the thesis.

2. The Office of Publications usually cannot reproduce oversize scores, maps, charts, or other illustrations larger than page size but it will give advice to students concerning the presentation of these materials and furnish names of businesses that can handle the work.

3. The typed manuscript pages must be delivered to Room 113, Communications Building; or to the Medical Center Copy Center; or to the Mountainlair Book Store Copy Center; or to the Allen Hall Copy Center.

4. Charges will be the published rates which may be obtained at the copy centers.

5. Normal lead time for completion of the work is three weeks and work cannot be accepted requiring earlier delivery. Students who desire faster service will be referred to duplicating shops that may be able to provide it.

6. Delivery cannot be made except upon payment in full by cash.

7. Phone numbers to use in making special inquiry concerning this service are 293-6366 (Communications Building); 293-5069 (Medical Center Basic Sciences Building); 293-5060 (Mountainlair Book Store); or 293-3467 (Allen Hall).

Final Examinations

The final examination is not to be given until the semester or summer session in which all other requirements for the degree are to be met. In programs requiring a thesis, or dissertation, the final examination must follow committee approval of

the manuscript. The student's adviser or committee chairperson must notify the Graduate School office in advance of the time, place, and recommended examining committee membership and receive clearance in the form of the student's "shuttle sheet" (copy of the student's record in Graduate School) before the examination can be given. Such notifications of doctoral examinations must be received in the Graduate School office at least three weeks before the examination date. All doctoral final oral examinations are open examinations and the lead time is required for public notice to the University community. Examining committees must be comprised of no fewer than three members for the master's degree and no fewer than five members for the doctor's degree. The chairperson and the majority of master's degree committee membership must be members or associate members of the Graduate Faculty. It is customary to name to the committee one person from a department other than that of the student's major field.

For doctoral programs both the dissertation and final examination chairpersons must be members (full) of the Graduate Faculty, as must the majority of the committee members. Every doctoral committee must include at least one person from a department other than that of the major field of the doctoral program. The student cannot be considered as having satisfactorily passed the final examination if there is more than one unfavorable vote among members of the examining committee. Results of each examination must be reported to the Graduate School office by return of the shuttle sheet within 24 hours of scheduled time regardless of whether the examination was actually held. Re-examination may not be scheduled without approval of the Dean of the Graduate School. No examination is to be given without the required number of committee members present: three for a master's, five for a doctoral examination. Additional requirements for research doctorates include acceptance by the Graduate School office of the dissertation bearing original signatures of at least all but one of the committee members. As with the final examination, if more than one member of the committee (whatever the size of the committee of at least five) dissents from approving the dissertation, the degree cannot be recommended.

Request for Degree

At the time of registration for the enrollment period in which all degree requirements are expected to be met, or at the latest within two weeks after such registration,* each candidate is to submit a formal request to the Dean of the Graduate School for the conferring of the degree; this is done on a special "Application for Graduation and Diploma" form (obtainable from the adviser or the Graduate School office). The candidate must complete all requirements at least one week before the end of that enrollment period. If the degree is not actually earned during that term, the student must submit a new "Application for Graduation and Diploma" when registering for the term in which completion is again anticipated.

Attendance at the spring Commencement is voluntary. Anyone not planning to attend should leave a complete mailing address with the Graduate School office so that the diploma can be mailed.

*The student must be registered in the enrollment period of graduation. See special provision for the student not in residence, page 31, "Registration Requirement," paragraph 2.

Graduate Degrees Offered by WVU

Master of Arts and Master of Science

Requirements

General. Regulations governing admission, registration, scholarship, etc., described in the preceding sections must be followed. These are also summarized in the "Information and Check List for Masters Candidates" available at the Graduate School office.

Program. At least 30 hours of graduate work planned with the student's graduate adviser must be satisfactorily completed within the period of seven years immediately preceding the conferring of the degree. The program must be formulated in writing at the earliest possible date so as to result in a cohesive, unified, and continuous plan of study. Most plans of study consist of certain amounts of work in major and minor fields. These are described in the departmental programs in Part 4 of the *Graduate School Catalog*. In degree programs requiring a thesis or problem report, appropriate course credits may be taken to cover the research and writing, but no more than 6 hours of credit earned for research or thesis may be counted in meeting course requirements for the degree.

Special. Each student, through consultation with a graduate adviser, must meet the special requirements of the faculty of the field of major study, subject to approval of the Dean of the Graduate School.

Degrees

Fields or departments in which these degrees are offered are as follows:

Master of Arts (M.A.) with a major in:

Art	History
Counseling and Guidance	Political Science
Economics	Psychology
Education Administration	Reading
Educational Psychology	Secondary Education
Elementary Education	Sociology
English	Special Education
Foreign Languages	Speech Communication
	Theatre

Master of Science (M.S.) with a major in:

Agricultural Biochemistry	Computer Science
Agricultural Economics	Family Resources
Agricultural Education	Genetics and Developmental
Agronomy	Biology
Anatomy	Geology
Animal Science	Horticulture
Biochemistry (Medical)	Industrial Relations
Biology	Mathematics
Chemistry	Medical Technology

Microbiology
 Mineral and Energy Resources
 Orthodontics
 Pharmaceutical Sciences
 Pharmacology
 Physical Education
 Physics
 Physiology and Biophysics

Plant Pathology
 Recreation
 Rehabilitation Counseling
 Reproductive Physiology
 Safety Studies
 Speech Pathology and Audiology
 Statistics
 Wildlife Management

Master of Science in the following designated fields:

Aerospace Engineering (M.S.A.E.)
 Chemical Engineering (M.S.Ch.E.)
 Civil Engineering (M.S.C.E.)
 Electrical Engineering (M.S.E.E.)
 Engineering (M.S.E.)
 Engineering of Mines (M.S.E.M.)
 Forestry (M.S.F.)

Industrial Engineering (M.S.I.E.)
 Journalism (M.S.J.)
 Mechanical Engineering
 (M.S.M.E.)
 Nursing (M.S.N.)
 Petroleum Engineering (M.S.
 Pet.E.)

Other designated master's degrees:

Agriculture (M. Agr.)
 Business Administration (M.B.A.)
 Fine Arts (visual) (M.F.A.)

Music (M.M.)
 Public Administration (M.P.A.)
 Social Work (M.S.W.)

Doctor of Philosophy

General Requirements

Regulations governing admission, registration, scholarship, etc., described in the preceding sections must be followed. Students applying for admission to a doctoral program after having received a master's degree at WVU must file a new completed form for admission to the Graduate School with the Office of Admissions and Records. This is to insure intent and proper records and does not entail an additional application fee.

The student must satisfy such special requirements, approved by the Graduate Dean, as may be required by the faculty responsible for the major field.

All of the requirements for any graduate degree must be completed within a period of seven years.

Candidacy Requirements

Admission to the Graduate School and enrollment in graduate courses does not of itself imply acceptance of the student as a candidate for a Ph.D. degree. This is only accomplished by (1) satisfactorily passing a comprehensive preliminary or qualifying examination (either oral, or written, or both) and (2) by meeting specified language and/or other requirements.

(1) *Qualifying Examination.* After a period of residence a student will be given a comprehensive examination in order to demonstrate whether a grasp has been attained of the important phases and problems of the field of major study, their relation to other fields of human knowledge and accomplishments, and the ability to employ rationally the instruments of research in the major field. The scheduling

and results of each such examination must be reported to the Graduate School office.

(2) *Foreign Language Examinations.* Competence in one or more foreign languages is a common requirement in graduate degree programs. The Graduate School does not set the foreign language requirement, but instead looks to the faculty in the graduate degree program to specify the language or languages and the level of competence to be demonstrated.

Language examinations are arranged by the Graduate School's foreign language examiner, who can be contacted through the Department of Foreign Languages or the Graduate School office, and under whose direction language examinations are administered. Information on the form of the examination and its scheduling is available to advisers and students from the Graduate School office.

When only reading competence is required, the foreign language examiner may waive examination in cases where the student's transcript shows, at a date that proves to fall no earlier than seven years before promotion to candidacy for the doctorate, either

- (a) completion of 12 semester hours or equivalent of course work in an approved foreign language, at WVU or at any other institution of recognized standing, with a grade of B or better in the last three hours, or
- (b) completion of French 306, German 306, or Russian 306 at WVU with a grade of B or better.

Advisers should request from the Graduate School Office the announcements regarding foreign language reading requirements and examinations, and the registration form for the examination, in order to be able to inform their students and follow established procedures.

Candidacy for the Ph.D. is granted when a student is certified as having satisfied language requirement and has successfully completed the qualifying examination.

Program

The program of Ph.D. study is planned with the student's graduate adviser and committee to combine any or all of the following: Graduate courses of instruction, special seminars, independent study, supervised research, and supervised training designed to promote a broad and systematic knowledge of the major field and to prepare the student for the comprehensive qualifying and final examinations and writing of the dissertation.

Residence

Graduate education, especially at the doctoral level, involves many learning experiences which take place outside the formal classroom setting. These involve observing and participating in activities conducted by the graduate faculty, using departmental and University libraries, attending lectures presented by visiting scholars, informal debates with fellow students, and similar activities.

To insure that their graduate students experience these kinds of informal learning, Ph.D. programs at WVU as elsewhere generally require three years in residence in full-time graduate study. However, because of the contractual nature of graduate study, an individual student or graduate committee may propose an

alternative plan by which the student can gain equivalent educational experience. For example, the plan of study may require the student to spend time in residence at a national or foreign laboratory, institute, archive, or research center as partial fulfillment of the residency requirement.

Dissertation

The candidate must submit a dissertation pursued under the direction of the faculty of the University on some topic in the field of the major subject. The dissertation must present the results of the candidate's individual investigation and must embody a definite contribution to knowledge. While conducting research or writing a dissertation the student must register at the beginning of each semester or summer during which credit is being earned. No residence credit will be allowed for special field assignments or other work taken off the University campus without prior approval by the Dean of the Graduate School.

Final Examination

If the candidate's dissertation has been tentatively approved and all other requirements have been met, upon proof of current registration and approval of the Dean of the Graduate School, the final oral examination on the dissertation can be scheduled. At the option of the faculty responsible for the degree program, a comprehensive final written examination also may be required. Results of the examination must be reported to the Graduate School office within twenty-four hours. These results, as well as acceptance of the dissertation, and certification of its suitability for immediate publication, must be reported by the committee chairperson to the Graduate School office not later than one week before the end of the semester or summer in which the degree is expected to be granted (one week before the end of the summer, one week before the end of the final examination period of the end of the first semester, or one week before Commencement Day at the end of the second semester).

Publication of Dissertations

All Ph.D. and other doctoral dissertations and their abstracts will be microfilmed through University Microfilms, Ann Arbor, Michigan. This requirement will not be satisfied by any other publication but does not preclude publication elsewhere which is both permitted and encouraged.

Candidates are to follow "Regulations Governing the Preparation of Dissertations and Theses" regarding format and organization of the dissertation and "A Review of Copyright Matters Related to Graduate Theses and Dissertations" for information pertaining to copyrights. Both of these are on file at the Graduate School office, department offices, offices of all graduate advisers, and the University libraries. The candidate is required to maintain close contact with the supervisor or chairperson of the graduate committee on these matters in developing a dissertation so as to incorporate the special requirements of the subject discipline.

One week before the close of the semester or summer in which the degree is expected to be conferred the candidate must meet the following requirements as well as others described in the "Information and Check List for Doctoral Candidates" obtainable at the Graduate School office:

1. Submit to the Graduate School office, in form satisfactory for microfilming, the typewritten, unbound original and first carbon copy of the

dissertation both signed by the candidate's committee. Two excellent machine-reproduced copies may be acceptable if approved in sample in advance and if final copies conform.

2. Submit to the Graduate School office one abstract as above of the dissertation consisting of no more than 600 words.

3. Submit to the Graduate School office a microfilm contract completed and signed by the candidate.

4. Pay a fee of \$30.00 at the Graduate School office to cover the cost of microfilming the dissertation and publication of the abstract in *Dissertation Abstracts*, a bi-monthly journal which receives wide distribution. This fee is payable by certified check made out to "West Virginia University." If desired, copyright service can be provided through the Graduate School office upon receipt, along with the dissertation, of a certified check for \$10.00 made payable to "University Microfilms."

5. Complete the questionnaire entitled "Survey of Earned Doctorates" obtained at the Graduate School office and return it there.

Major Fields

Programs toward the Ph.D. are offered in the following major fields:

Agricultural Biochemistry
Agricultural Microbiology
Agronomy
Anatomy
Animal Nutrition
Biochemistry (Medical)
Biology
Chemistry
Economics
Engineering
English
Forest Resources Science

Genetics and Developmental Biology
Geology
History
Microbiology (Medical)
Music
Pharmacology
Physics
Physiology and Biophysics
Plant Pathology
Political Science
Psychology
Reproductive Physiology

Doctor of Education (Ed.D.)

The program of study for the degree of Doctor of Education (Ed.D.) is planned with the student's graduate adviser and committee. It combines courses of instruction, seminars, supervised research, and ancillary experience intended to provide the candidate with a variety of educationally related competencies. Special requirements, such as tools of research, also may be specified by the student's committee. All the requirements for the degree are to be completed within a period of seven years.

The Ed.D. is a program based on competencies and thus given may provide a broad overview of education or it might delve very deeply into a single aspect. Thus it is possible for a student to study music education under the supervision of the graduate faculty in the College of Human Resources and Education in cooperation with that of the Creative Arts Center. In similar manner, there is cooperation with the graduate faculty in the School of Physical Education to form committees for those interested in physical education or safety studies, and with the College of Engineering graduate faculty for studies in engineering education.

College facilities and faculty expertise make it possible for students wishing to concentrate more heavily in such fields as curriculum development (elementary or secondary), counseling and guidance, education administration, health education, reading, special education, and technology education.

A more extensive description of the Ed.D. can be found in the College of Human Resources and Education section of the *Graduate School Catalog*.

Doctor of Music Arts (D.M.A.)

The degree of Doctor of Musical Arts is offered through the Creative Arts Center.

Assistantships, Fellowships, and Traineeships at WVU

West Virginia University annually awards over 500 graduate assistantships supported from state appropriations, federal funds, private grants, and contracts; and about 200 fellowships and traineeships derived from federal programs such as HEW, NIH, NSF, VA, etc., and from industries and private foundations. The awards are made in degree programs, and application must be initiated in the unit administering the program.

Stipends for assistantships are generally stated in terms of 9 or 12-month appointments for half-time service, i.e., 20 hours service per week in the case of research assistantships, and the assisting with instruction of two courses or the equivalent in the case of teaching assistantships. Most fellowships and traineeships require enrollment for full-time study but no formal teaching or research duties. Tuition and registration fees are generally remitted. Departments may occasionally make appointments for more than or for less than half-time service with proportionately adjusted compensation. In the latter case, the remission of tuition and registration fees also is reduced proportionately. Assistants giving half-time service are advised to take no more than 12 credit hours in any one semester and some college, school, and department regulations may be more strict in this regard.

Fellowships are awarded on the basis of academic merit and require no service in return. A graduate fellow is expected to spend full time in pursuit of studies, but may teach the extent required by the particular degree program.

Applications should be made by the first week of February to the dean of the college or school concerned or to the chairperson of the program in which the graduate work will be pursued.

Remission of Fees

Graduate assistants, fellows, and trainees the conditions of whose stipends include remission of tuition and registration fees are also entitled to remission of the Higher Education Resources fee. Like all students they must pay the Mountainlair Construction and Daily Athenaeum fees, but with regard to the rest of the Institutional Activity fee they are granted the same option as are part-time students.

Agriculture and Forestry

Graduate research assistantships at stipends of \$3,576 and \$4,200 for those holding bachelor or master degrees, respectively, are available on a 12-month basis

for half-time service, permitting a maximum of 9 credit hours per semester and waiving of tuition, in agricultural biochemistry, animal and veterinary science, forestry, plant sciences, and resource management. Teaching assistantships at stipends of \$2,844 on a 9-month basis requiring half-time service, permitting a maximum of 9 credit hours per semester and waiving of tuition, are also available.

Arts and Sciences

Teaching assistantships are distributed among all departments in the College of Arts and Sciences which have graduate programs. Stipends are graduated, starting at \$2,628 for a person in the first year of graduate study and rising to \$3,240 for a person with a master's degree and a year's study toward a doctorate. All are for 9 months, and require half-time service. Tuition and registration fees are waived.

Some departments have special assistantships, such as research assistantships, which carry greater responsibilities and correspondingly better stipends. Some fellowships are also assigned by individual departments. Information on these is available at the departmental offices.

Benedum Foundation and WVU Foundation Doctoral Fellowships

Michael L. Benedum has been a special benefactor to WVU through his establishment of the Claude Worthington Benedum Foundation, named in memory of his son. Through a challenge grant from this foundation and a generous response from the WVU Foundation, Inc., the Graduate School is able to offer Claude Worthington Benedum Fellowships and WVU Foundation Doctoral Fellowships.

These three-year fellowships are awarded to students who have displayed previous evidence of scholarship and of dedication to academic, artistic, and investigative pursuits. Yearly stipends are \$4,000 for full-time, full-year enrollment or pro-rated at \$333 per month during the 9 months of the regular academic year. These fellowships are competitive, and selection is based on previous academic performance, letters of reference, GRE or other standardized achievement examination, and the applicant's statement of professional goals. Candidates must be nominated by the faculty of the proposed doctoral program no later than mid-February. (Get the specific date from the Graduate School office.)

Business and Economics

Graduate research assistantships are available on a 9-month basis for half-time service, in accounting/finance and management/marketing at a stipend of \$2,151, and in economics at stipends of \$2,151 to \$2,500; and teaching assistantships in economics on the same basis at \$3,300. Tuition and registration fees are waived.

Creative Arts

Teaching, research, performance, and technical assistantships from \$2,250 for 9 months, half-time service. Tuition and registration fees are waived.

Engineering Experiment Station

Research assistantships in aerospace, chemical, civil, electrical, industrial, mechanical engineering and mechanics, mining, nuclear, petroleum, and geological engineering. Stipends \$250 to \$450 per month for 9 to 12 months, half-time service. Tuition and registration fees are waived.

Extension and Continuing Education

Office of Research and Development — Research assistantships up to \$2,700 for 9 months and \$3,600 for 12 months, half-time service, tuition and registration fees waived.

Water Research Institute — Research assistantships up to \$3,600 for 9 months and \$4,800 for 12 months, half-time service. Tuition and registration fees are waived.

Human Resources and Education

Research and teaching assistantships up to \$3,400 for 9 months, half-time service. Tuition and registration fees are waived.

Journalism

Teaching assistantships and graduate internships at \$2,151 and up for 9 months. Fifteen hours work per week. Tuition and registration fees are waived.

Medical Science

Support from training, research, and other grants in anatomy, biochemistry, microbiology, pharmacology, and physiology and biophysics; stipends from \$3,500 to \$4,000 for 12 months. Additional allowances for dependents.

Teaching assistantships at \$3,200 for 12 months. Competitive research fellowships at \$3,200 also available. Applicants should address the faculty of the appropriate graduate program and submit GRE scores, letters of reference, and transcripts of previous academic course work.

Nursing

Professional Nurse traineeships are available to graduate full-time students in nursing. Amounts vary from waiver of tuition and registration fees to maximum stipend of \$2,600 for 8 months. Varies with the student's financial need.

Physical Education

Teaching and research assistantships up to \$2,160 for 9 months, half-time service, tuition exempt.

Regional Research Institute

A limited number of part-time research fellowships are awarded to graduate students who demonstrate a strong aptitude and interest in regionally oriented

basic research in the social sciences. Awards in variable amounts up to \$4,050 for 9 months. Tuition and registration fees are waived.

Social Work

Graduate traineeships for master's degree candidates. Stipends up to \$3,300 for 12 months. Student pays tuition and registration fees.

Financial Aids: Loans, Employment

Information and guidance on loans for graduate students are available in the Financial Aid Office, Mountainlair.

On-campus employment opportunities can be investigated at the Financial Aid Office in Mountainlair and the Personnel Office, Knapp Hall.

Stipend Payment Dates for WVU Foundation, HEW, NSF Trainees, and Fellows

The start of entitlement periods under these awards is usually September 1 of each year. Invoices for payments are prepared in the Graduate School Office each month between the 10th and 15th for entitlements earned during that month. Checks are normally available at the Graduate School Office for the students on the first day of the next month. Students to receive stipends under these programs must arrange their finances accordingly for their needs from the beginning of the First Semester to October 1.

Fellowship Opportunities for Study in the U.S. or Abroad

Danforth Graduate Fellowships

Danforth Graduate Fellowships provide support to persons committed to careers in college and university teaching in subjects likely to be taught in the undergraduate liberal arts curriculum. Awards are for one year, renewable to a maximum of four years. Awards are made both to graduating seniors and to mature persons already holding a bachelor's degree.

Undergraduates may apply through the WVU liaison officer, Prof. Nicholas Evans, assistant to the dean, Arts and Sciences, in October, while graduates should request application forms from the Danforth Foundation, 222 South Central Avenue, St. Louis, MO 63105, by November 1.

Fulbright-Hays Grants for Study Abroad

These grants are provided under the Mutual Educational Exchange (Fulbright-Hays) Program and by other donors for study in any of more than forty countries. The majority of these one-year awards go to advanced graduate students who will engage in dissertation research, although some are open to seniors and master's candidates.

Enrolled students must apply by about October 15 through the WVU liaison officer, Prof. Rodger Yeager, Director of International Programs, 2112 Agricultural Sciences Building.

Marshall Scholarships

Marshall Scholarships are awarded annually to about thirty graduating seniors for two years of study in a British university. University endorsement of applicants is required, and seniors interested should contact the WVU liaison officer, Prof. Rodger Yeager, 2112 Agricultural Sciences Building, before the end of September.

Completed applications must be in Philadelphia by a date set annually by the program, usually in the second half of October.

NSF Graduate Fellowships

Available for U. S. citizens or nationals in the fields of mathematical, physical, medical, biological, engineering, and social sciences, and in the history and philosophy of science. Stipend is \$3,600 for a 12-month tenure in up to three years. The student applies directly to the Fellowship Office, National Academy of Sciences, National Research Council, 2101 Constitution Ave., N.W., Washington, DC 20418. The student may select his own graduate school, but it is the student's responsibility to obtain admission. Application deadline is about December 1.

Oak Ridge Associated Universities

West Virginia University is one of the sponsors of Oak Ridge Associated Universities (ORAU), a nonprofit education and research management corporation of 43 colleges and universities. ORAU, established in 1946, conducts programs of research, education, information, and human resource development for a variety of government and private organizations. It is particularly interested in three areas: energy, health, and the environment.

Among ORAU's activities are competitive programs to bring undergraduate and graduate students and faculty members to work on research problems at the research facilities of the Energy Research and Development Administration (ERDA). Participants are selected by ORAU and the staffs of the facilities participating in the ORAU programs, which are Oak Ridge National Laboratory; the Oak Ridge Y-12 Plant; the Oak Ridge Gaseous Diffusion Plant; the Atmospheric Turbulence and Diffusion Laboratory in Oak Ridge; the Savannah River Laboratory and Savannah River Ecology Laboratory in Aiken, S.C.; the Comparative Animal Research Laboratory in Oak Ridge; the Puerto Rico Nuclear Research Center; and the Energy Research Centers in Bartlesville, Okla., Pittsburgh, Pa., and Morgantown. The ORAU Institute for Energy Analysis, the Special Training Division, the Medical and Health Sciences Division, and its other programs also are open to qualified students and faculty members.

Graduate. The ORAU Laboratory Graduate Participation Program enables a candidate for an advanced degree, upon completion of all requirements for work-in-residence, except research, to work toward completion of the student's research problem and preparation of the thesis at one of the participating sites.

Undergraduate. The ORAU Undergraduate Research Training Program offers juniors majoring in the sciences, engineering, and mathematics an opportunity to spend 10 weeks during the summer working in directed research programs at these sites.

Faculty. Faculty members of WVU, under the ORAU Faculty Research Participation Program, can go to an ERDA facility for varying periods up to three months, for advanced study and research. It also is possible to combine a sabbatical with a longer appointment.

Stipends. Student stipends are at fixed rates that change from time to time. Faculty stipends are individually negotiated, based upon the current University salary.

A copy of the bulletin and announcement of the ORAU-Energy Research and Development Administration university-laboratory programs is available in the WVU Grants and Contracts Office. Bulletins also may be obtained by writing to the University Programs Office, Oak Ridge Associated Universities, Inc., Box 117, Oak Ridge, TN 37830.

Interested persons should ask for assistance from Dr. Mark H. Conner, grant resources officer, who serves as the ORAU Councilor at WVU.

Public Health Service Predoctoral Fellowships

These fellowships are available for U.S. citizens or those lawfully admitted to the U.S. for permanent residence having bachelor's degree or equivalent training. Graduate work must be in the basic sciences such as biology, chemistry, physiology, biochemistry, etc., as they relate to problems of health and disease; among the social sciences, those areas such as psychology and sociology and anthropology that relate to the problems of health and disease, and some interdisciplinary fields such as biostatistics, medical economics, cultural anthropology, etc. Stipend is \$2,400 at first-year level with \$500 for each qualified dependent and certain travel expenses; up to \$2,800 for candidate in final year of doctorate program. Application by form from Chief, Career Development Review Branch, Division of Research Grants, National Institutes of Health, Bethesda, MD 20014.

Under Public Health Service grants, there are graduate traineeships available which include the fields of air pollution control engineering and other environmental engineering fields. They range from \$3,000 for first-year students to \$3,600 for post-master's students, plus \$500 per dependent, certain travel allowances, and tuition exempt. Information on these particular traineeships is available from the Department of Civil Engineering.

Rhodes Scholarships

Open to men and women, Rhodes Scholarships provide for two years of study at Oxford University in England, with a third year possible in exceptional cases.

Applications must be received in Charleston before the end of October, addressed to Roger W. Tompkins, Secretary of the West Virginia State Committee, Rhodes Scholarships, 1200 Commerce Square, Charleston, WV 25325. The United States headquarters address is Rhodes Scholarship Office, Wesleyan University, Middletown, CT 06457.

Since a WVU faculty group will file its appraisal of candidates, students applying should notify the WVU liaison officer, Prof. Rodger Yeager, 2112 Agricultural Sciences Building, at least two weeks before the due date.

Additional Reference to Fellowship Opportunities

"A Selected List of Major Fellowship Opportunities and Aids to Advanced Education for United States Citizens" provides excellent short summaries concerning sources of support for graduate study and research. Obtainable from the Fellowship Office, Office of Scientific Personnel, National Research Council, 2101 Constitution Ave., Washington, D.C. 20418.

Part 3

FINANCIAL INFORMATION

Fees and Expenses

All West Virginia University fees are subject to change without notice.

A nonrefundable special service fee of \$10.00 must accompany applications for admission to the Graduate School.

All fees are due and payable at the Comptroller's desk in the Coliseum on the days of registration. Medical Center students pay their fees at the Comptroller's Office, Basic Sciences Building. Students must pay fees before registration is accepted and class tickets are released. Completion of arrangements with the Comptroller's Office for payment from University payroll checks, officially accepted scholarships, loan funds, grants, or contracts shall be considered sufficient for acceptance of registration. Fees paid after regular registration must be paid to the University Cashier in Mountainlair. Medical Center students pay at the Comptroller's Office, Basic Sciences Building.

Any student failing to complete registration on regular registration days is subject to the Late Registration Fee of \$10.00.

Students registering pay the fees shown in the fees charts, plus special fees and deposits as required.

No degree will be conferred upon any candidate before payment of all tuition, fees, and other indebtedness to any unit of the University.

Persons not registered as University students and who are not members of its administrative or teaching staffs shall not be admitted to regular attendance in University classes.

Fees for Off-Campus Courses

Fees for credit hours for off-campus students are the same as those charged students enrolled in on-campus courses. Off-campus students do not pay the Daily Athenaeum Fee or the Mountainlair Construction Fee.

Laboratory Fees

Consult specific departmental sections of this *Catalog* concerning nonrefundable deposits and microscope rental fee.

Music Practice and Rental Fees

Practice Room Fee. All full-time Music Students must pay a fee of \$6.00 per semester, which entitles them to assigned practice space one hour per day. Additional space may be available at the rate of \$4.00 per hour.

Band and Orchestra Instruments. Rental, \$10.00 per semester.

Special Fees

Application for Admission (Law and Graduate School)	\$10.00
Certificate of Advanced Study in Education	2.00
Change in Registration (after eighth day)	1.00
Correspondence Course in Guided Reading (per course)	1.00
Diploma Replacement	5.00
Examination for Advanced Standing	3.00
Examination for Entrance Credit, per unit	1.00
Examination of Candidate for Graduate Degree	1.00
(For graduate students not otherwise enrolled at time of final examination)	
General Educational Development Tests (high school level)	15.00
(If the applicant applies for admission to and registers in WVU within twelve months of the date of qualifying for the test, a \$10.00 credit shall be established for the applicant.)	
Graduation	10.00
(Payable by all students at the beginning of the semester or session in which they expect to receive their degrees.)	
Late Registration (nonrefundable)	10.00
(Not charged to full-time students who complete registration during the regular registration days set forth in the University Calendar. Not charged to part-time students who complete registration by the close of office hours on the eighth day following the beginning of General Registration.)	
Professional Engineering Degree (includes \$10.00 Graduation Fee)	25.00
Reinstatement of Student Dropped from the Rolls	3.00
Student Identification Card Replacement	1.00
Student's Record Fee	1.00
(One transcript of a student's record is furnished by the Dean of Admissions and Records without charge. This fee is charged for furnishing an additional transcript.)	

Summer Fees

Tuition, per semester hour	Resident	Nonresident
Undergraduate students	\$10.00	\$51.00
Professional and Graduate students	15.00	70.00
Dentistry and Medicine students	22.00	82.00
Daily Athenaeum Fee*55	.55
Health, Counseling, and Program Services Fee	11.60	11.60
Mountainlair Construction Fee per 6-week summer session or any portion thereof*	7.50	7.50
Student Educational Services Fee	5.65	5.65
Transportation Fee	5.60	5.60

*Fee required of all students. (Nonrefundable unless student withdraws officially before the close of general registration.)

Semester Fees in Colleges and Schools

(Subject to Change Without Notice.)

FULL-TIME ¹

UNDERGRADUATE ^a

	<i>Tuition</i>	<i>Registration</i>	<i>Higher Education Resources</i>	<i>Institutional Activity</i>	<i>Mountainair Construction</i>	<i>TOTAL</i>
<i>Resident</i>	\$ 40.00	\$ 50.00	\$ 25.00	\$77.50 ^c	\$20.00	\$212.50
<i>Nonresident</i>	205.00	250.00	150.00	77.50 ^c	20.00	702.50

PROFESSIONAL AND GRADUATE ^b

<i>Resident</i>	\$ 55.00	\$ 50.00	\$ 25.00 ^c	\$77.50 ^c	\$20.00	\$227.50
<i>Nonresident</i>	230.00	250.00	150.00 ^c	77.50 ^c	20.00	727.50

DENTISTRY AND MEDICINE

<i>Resident</i>	\$117.00	\$ 50.00	Not Applicable ^d	\$77.50 ^c	\$20.00	\$264.50
<i>Nonresident</i>	335.00	250.00	Not Applicable ^d	77.50 ^c	20.00	682.50

^a Undergraduate students enrolled for 12 or more credit hours pay maximum charges as indicated. Students enrolled for less than 12 credit hours pay a pro-rated charge calculated in direct proportion to the number of credit hours taken.

^b Professional and graduate students enrolled for 9 or more credit hours pay maximum charges as indicated. Students enrolled for less than 9 credit hours pay a pro-rated charge calculated in direct proportion to the number of credit hours taken.

"Professional and Graduate," for fee purposes, includes all programs in the Medical Center, except Dentistry, Medicine, and Pharmacy; all programs in the Graduate School, and in the College of Law.

^c Paid by Law and Graduate students only. Others pay appropriate laboratory and microscope fees.

^d Dental and Medical students pay appropriate laboratory and microscope fees.

^e Includes Athletic Fee, \$15.00; Student Educational Services Fee, \$15.00; Daily Athenaeum Fee, \$1.50; Health, Counseling, and Program Services Fee, \$31.00; Transportation Fee, \$15.00.

PART-TIME ²

<i>Tuition per semester hour</i>	<i>Resident</i>	<i>Nonresident</i>
Undergraduate Students	\$10.00	\$51.00
Professional and Graduate Students	15.00	70.00
Dentistry and Medicine Students	22.00	82.00

The minimum rate for noncredit courses is that charged for one semester hour of credit.

¹ A full-time professional or graduate student is one who is registered for 9 or more semester hours of work each semester of the regular academic year, or 6 or more semester hours of work during the summer. A full-time student during the regular academic year and all students during the summer are entitled to free medical consultation and advice from the University physician. A moderate charge is made for room calls, X-rays, special laboratory tests, drugs furnished by the University Pharmacy, minor operations, treatment of fractures and dislocations, and intravenous treatment.

A full-time undergraduate student is one who is registered for 12 or more semester hours of work each semester of the regular academic year, or 6 or more semester hours of work during a 6-week summer session. A full-time student during the regular academic year receives an identification card which entitles the student to all athletic events. A full-time student during the regular academic year and all students during the summer are entitled to free medical consultation and advice from the University physician. A moderate charge is made for room calls, X-rays, special laboratory tests, drugs furnished by the University Pharmacy, minor operations, treatment of fractures and dislocations, and intravenous treatment.

² For fee assessment purposes, a part-time professional or graduate student is one who is registered for fewer than 9 semester hours per semester during the regular academic year, or for fewer than 6 semester hours during a 6-week summer session.

A part-time undergraduate student is one who is registered for fewer than 12 semester hours per semester during the regular academic year, or for fewer than 6 semester hours during a 6-week summer session.

Auditors

Students may enroll in courses without working for grade or for credit by registering as auditors and by paying full fees. Change in status from audit to credit or from credit to audit may be made during the registration period. Attendance requirements for auditors shall be determined by the instructor of the course being audited. It is the prerogative of the instructor to strike the name of any auditor from grade report forms and to instruct the Office of Admissions and Records to withdraw the auditor from the class, if attendance requirements are not met.

Remission of Fees

The tuition fee and registration fee will be remitted to a person registered in the Graduate School or the College of Law and who is employed by the University on a regular appointment, subject to the following:

(a) There will be no remission of the Daily Athenaeum Fee or the Mountainlair Construction Fee. These fees are charged all students, full-time and part-time, who are enrolled for regular courses of resident instruction.

(b) Except as provided in "c", a graduate teaching or graduate research assistant will receive remission of tuition fee and registration fee commensurate with the hours of service required by the terms of the assistant's appointment.

(c) A faculty member on full-time appointment at any recognized institution of higher learning in West Virginia who is taking a course of graduate study at WVU and holds an appointment as a graduate assistant will receive full remission of tuition and registration fees.

(d) A regular appointment must be effective at the beginning of a semester or summer session. Exemption from tuition fee and registration fee must be claimed at the beginning of the registration period or, in the case of a substitute appointment, within ten days after the appointment has been made.

(e) An employee who holds a regular appointment and is eligible for remission of tuition fee and registration fee in the second semester of any regular academic year also is eligible for remission of tuition fee and registration fee in the summer session immediately following the student's term of appointment.

In certain cases an employee on regular University appointment may be permitted to register as a full-time student in the Graduate School or the College of Law. If such an employee does register as a full-time student and qualifies for remission of tuition fee and registration fee, the employee shall not be subject to the Special Services fees, except the Daily Athenaeum Fee and the Mountainlair Construction Fee, but must pay such fees to be entitled to the services provided thereby. Such employees do not receive the student identification card which provides for athletic admissions, student educational services, and health, counseling, and program services, etc.

Refunding of Fees

A student who officially withdraws from University courses may arrange for a refund of fees by submitting to the University Comptroller evidence of eligibility for a refund.

To withdraw officially, a student must apply to the Dean of Admissions and Records for permission. Semester fees will be returned in accordance with the following schedule:

First refund period ending on the twelfth day following the beginning of General Registration	} All Activity fees chargeable to Special Services and all other semester fees less \$2.50. (Under no circumstances is the amount retained less than \$2.50.)
Second refund period ending on the fifth Friday following the beginning of General Registration	} 70% of all refundable fees
Last refund period ending on the eighth Friday following the beginning of General Registration	} 40% of all refundable fees

The second Friday following the beginning of general registration for the summer session or a summer term is the end of the refund period.

No part of the Activity Fee is refundable unless the student withdraws from the University.

University policy provides that students called to the armed services of the United States may be granted full refund of refundable fees, but no credit, if the call comes before the end of the first three-fourths of the semester, and that full credit of courses be granted to persons called to the armed services of the United States if the call comes thereafter; provided, however, that credit as described above will be granted only in those courses in which the student is maintaining a passing mark at the time of departure for military service. In the recording of final grades, for three-fourths of a semester or more, both passing and failing grades are to be shown on the student's permanent record.

Service Charge on Returned Checks

A service charge of 5 percent of the amount of each check returned unpaid by the bank upon which it is drawn shall be collected unless the student can obtain an admission of error from the bank.

If the check returned by the bank was in payment of University and registration fees, the Comptroller's Office shall declare the fees unpaid and registration cancelled if the check has not been redeemed within three days from date of written notice. In such a case the student may be reinstated upon redemption of the check, payment of the 5 percent service charge, Reinstatement Fee of \$3.00, and Late Payment Fee of \$10.00.

Residential Status

The West Virginia Board of Regents has adopted regulations governing the classification of students as residents or nonresidents for admission and fee purposes at all institutions under its jurisdiction.

General

Students enrolling in WVU shall be classified as resident or nonresident for admission, tuition, and fee purposes by the Dean of Admissions and Records. The decision shall be based upon information furnished by the student and all other relevant information. The Dean of Admissions and Records is authorized to require such written documents, affidavits, verifications, or other evidence as are deemed necessary to establish the domicile of a student. The burden of establishing residency for tuition and fee purposes is upon the student.

If there is a question as to residence, the matter must be brought to the attention of the Dean of Admissions and Records and passed upon at least two weeks before registration and payment of tuition and fees. Any student found to have made a false or misleading statement concerning the student's residence shall be subject to disciplinary action and will be charged the nonresident fees for each session theretofore attended.

Residence Determined by Domicile

Domicile within the state means adoption of the state as a fixed permanent home and involves personal presence within the state with no intent on the part of the person to return to another state or country. West Virginia domicile may be established upon the completion of at least twelve months of continued residence within the state before the date of registration, provided that such twelve months residency is not primarily for the purpose of attendance at any institution of learning in West Virginia.

Establishment of West Virginia domicile with less than twelve months residence before the date of registration must be supported by proof of positive and unequivocal action, such as, but not limited to, the purchase of a West Virginia home, full-time employment within the state, paying West Virginia property tax, filing West Virginia income tax returns, registering to vote in West Virginia and the actual exercise of such right, registering of motor vehicles in West Virginia, and possessing a valid West Virginia driver's license. Additional items of lesser importance include transferring or establishing local church membership, involvement in local community activities, affiliation with local social, civic, fraternal, or service organizations, and various other acts which may give evidence of intent to remain indefinitely within the state. Proof of a number of these actions shall be considered only as evidence which may be used in determining whether or not a domicile has been established.

Minors

Minors are defined by the West Virginia Code (2-2-10) as persons under 18 years of age. The residence of a minor shall follow that of the parents at all times, except in extremely rare cases where emancipation can be proved beyond question. The residence of the father, or the residence of the mother if the father is deceased, is the residence of the unmarried or unemancipated minor. If the father and the

mother have separate places of residence, the minor takes the residence of the parent with whom the minor lives or to whom the minor has been assigned by court order. The parents of a minor will be considered residents of West Virginia if their domicile is within the state.

A minor student who is properly admitted to an institution as a resident student shall retain that classification as long as the student enrolls each successive semester.

Emancipated Minor

An emancipated minor may be considered as an adult in determining residence, provided satisfactory evidence is presented that neither of the parents, if living, contribute to the minor's support nor claim the minor as a dependent for federal or state income tax purposes.

In the event that the fact of emancipation is established, the emancipated minor assumes all of the responsibilities of an adult to establish residence for tuition and fee purposes. Proof must be provided that emancipation was not achieved principally for the purpose of establishing residence for attendance at an institution of higher education.

Students 18 Years of Age or Over

A student 18 years of age or over may be classified as a resident if: (1) the parents were domiciled in the state at the time the student reached majority and such student has not acquired a domicile in another state, or (2) while an adult the student has established a bona fide domicile in West Virginia. Bona fide domicile in West Virginia means that the student must not be in the state primarily to attend an educational institution and the student must be in the state for purposes other than to attempt to qualify for resident status.

Any nonresident student who reaches the age of 18 years while a student at any educational institution in West Virginia does not by virtue of such fact alone attain residence in this state for admission or tuition and fee payment purposes.

A student who is properly classified as a resident at the time of attaining the age of 18 shall continue to be classified as a resident as long as the student enrolls each successive semester and does not establish a domicile, or legal residence, in another state.

Change of Residence

An adult student who has been classified as an out-of-state resident and who seeks resident status in West Virginia must assume the burden of proving conclusively that the student has established domicile in West Virginia with the intention of making the student's permanent home in this state. The intent to remain indefinitely in West Virginia is evidenced not only by a person's statements but also by a person's actions. The Dean of Admissions and Records in making his determination shall consider such actions as, but not limited to, the purchase of a West Virginia home, full-time employment within the state, paying West Virginia property tax, filing West Virginia income tax returns, registering to vote in West Virginia and the actual exercise of such right, registering of motor vehicles in West Virginia, and possessing a valid West Virginia driver's license. Additional items of lesser importance include transferring or establishing local church membership, involvement in local community activities, affiliation with local social, civic,

fraternal, or service organizations, and various other acts which may give evidence of intent to remain indefinitely within the state. Proof of a number of these actions shall be considered only as evidence which may be used in determining whether or not a domicile has been established. Factors militating against a change in residence classification may include such considerations as the fact that the student is not self-supporting, that the student is carried as a dependent on the parents' federal or state income tax returns or the parents' health insurance policy, and that the student customarily does not remain in the state when school is not in session.

Marriage

The residence of a married person is determined by the same rules of domicile which would apply if he or she were not married.

Military

An individual who is on active military service or an employee of the federal government may be classified as a resident for the purpose of payment of tuition and fees provided the individual established a domicile in West Virginia before entrance into federal service, that the individual entered the federal service from West Virginia, and that the individual has at no time while in federal service claimed, or established, a domicile in another state. Sworn statements attesting to these conditions may be required. The wife and dependent children of such individuals also shall be classified as residents of the state of West Virginia for tuition and fee purposes. Persons assigned to full-time active military service and residing in West Virginia may be classified as in-state residents for tuition and fee purposes after twelve months of continuous location in the state.

Aliens

An alien in the United States on a resident visa, or who has filed a petition for naturalization in the naturalization court, and who has established a bona fide domicile in West Virginia may be eligible for resident classification, provided the alien is in the state for purposes other than to attempt to qualify for residency status as a student.

Appeal Process

The decisions of the Dean of Admissions and Records may be appealed to the President of WVU. The President may establish such committees and procedures as he determines necessary for the processing of appeals. The decision of the President may be appealed in writing with supporting documentation to the West Virginia Board of Regents in accord with such procedures as may be prescribed from time to time by the Board of Regents.

Part 4

PROGRAMS AND COURSES OF STUDY

Plan for Numbering Courses

For convenience, each course of study is designated by the name of the department in which it is given and by the number of that course. The plan for numbering is as follows:

Courses 200 to 299 — Courses for advanced undergraduate students and selected graduate students. No more than 40 percent of the credits counted for meeting requirements for a graduate degree can be at the 200 level.

Courses 300 to 399 — Courses for graduate students; students in professional programs leading to the doctorate; and selected, advanced undergraduates. Undergraduates in any class carrying a 300-level course number should have a 3.0 cumulative grade-point average and have written approval on special forms from their instructors and advisers and the Graduate School Dean. Seniors within 12 semester hours of graduation may, with prior approval on special senior petition forms of their advisers and Graduate School Dean, enroll in 300-level graduate courses. (In summary, 200-level courses are intended primarily to serve undergraduate students; 300-level courses are intended primarily to serve introductory graduate and master's degree course needs.)

Courses 400 to 499 — Courses for graduate students only. All doctor's degree dissertation hours shall be awarded at the 400 level — specifically under course number 497.

Graduate degree credit hour requirements must include at least 60 percent at the 400 and 300 level.

Descriptions of Courses

I	— a course given in the first semester
II	— a course given in the second semester
I, II	— a course given in each semester
I and II	— a course given throughout the year
Yr.	— a course continued through two semesters
S	— a course given in the summer session
hr.	— credit hours per course
rec.	— recitation period
lab.	— laboratory period
Conc.	— concurrent registration required
PR:	— prerequisite
consent	— consent of instructor required
CR	— credit but no grade

Note

Courses in this *Catalog* are subject to change without notice.

Agriculture and Forestry

AGRICULTURE

Master of Agriculture

Admission requirements are those established by the Graduate School for master's degree candidates. Students desiring this degree must obtain approval from the Master of Agriculture Committee in the College of Agriculture and Forestry. The student's baccalaureate degree should be in a field sufficiently related to the course of study contemplated to provide the necessary background. A student whose baccalaureate degree is in a field considered not sufficiently related to the study contemplated may be admitted on probation, special provisional, or regular with deficiencies until specific requirements are met or the student may be admitted on the basis of evidence of satisfactory professional experience.

Requirements. The student will select a minimum of 27 hours from the course offerings of the three divisions of Agriculture in the College (Divisions of Animal and Veterinary Sciences, Plant and Soil Sciences, and Resource Management). A minimum of 9 hours will be selected from the offerings of each division. The maximum to be counted from each division, including the problem report, will be 15 hours. No more than 3 hours of Special Topics or Advanced Study from each division may be counted towards the degree.

A three-hour problem report can be included at the option of the student and the Program Committee.

The committee charged with administering the degree program is appointed by the Dean of the College of Agriculture and Forestry.

The graduate committee of each candidate shall have one member of the administering committee as a member. This member shall not be the chairman or student adviser.

The student may choose the additional courses from within the College of Agriculture and Forestry or from offerings of other colleges and schools of WVU. An overall grade-point average of 3.0 is required for graduate courses included as part of the approved program for the degree.

Agriculture

Ag.

200. *Agricultural Travel Course.* S. 6 hr. Tour and study of production methods in major livestock and crop regions of the United States and other countries. Influence of population, climate, soil, topography, markets, labor, and other factors on agricultural production.
360. *Problem Report for the Degree of Master of Agriculture.* I, II, S. 1-3 hr.

AGRICULTURAL BIOCHEMISTRY

The Interdivisional Committee of Agricultural Biochemistry in the College of Agriculture and Forestry is responsible for planning and conducting course offerings in agricultural biochemistry and the graduate degree programs in agricultural biochemistry.

In addition to the requirements for admission to the Graduate School, applicants for admission to the graduate degree programs in agricultural biochemistry must have an overall grade-point average of at least 2.5 in general, analytical, organic, and physical chemistry. Deficiencies in these courses may be removed during the first year of graduate enrollment if prior consent is obtained from the agricultural biochemistry faculty.

The agricultural biochemistry student must attain a minimum final grade-point average of 3.0 in the student's formal graduate course work, which is approved early in the student's graduate enrollment.

A. L. Barr and M. E. Gallegly, chairman of the Division of Animal and Veterinary Sciences and the Division of Plant Sciences, respectively, are co-administrators for the agricultural biochemistry program.

Master of Science

Work for the degree of Master of Science consists chiefly of course offerings selected according to the special needs of the student from 300 and 400 courses in agricultural biochemistry, medical biochemistry, chemistry, statistics, and the biological sciences. A total of no fewer than 30 hours of graduate credit is required, of which no more than 6 may be for research. A thesis is required.

Doctor of Philosophy

Applicants for the degree of Doctor of Philosophy must pass comprehensive written and oral examinations in biochemistry and one or two minor fields. The applicant does not become a candidate for the degree until passing the comprehensive examination.

Agricultural Biochemistry

Ag. Bi.

- 210. *Introductory Biochemistry*. I, II. 3 hr. PR: Two semesters of general chemistry and one semester of organic chemistry. The biochemistry of the proteins, carbohydrates, lipids, nucleic acids, enzymes, coenzymes, and cellular metabolism in plants and animals.
- 212. *Nutritional Biochemistry*. II. 3 hr. PR: Ag. Bi. 210 or consent. Nutritional biochemistry of domestic animals.
- 310. *General Biochemistry*. I. 3 hr. PR: 8 hr. Organic chemistry. A general course in biochemistry primarily intended to meet the needs of graduate students.
- 311. *Laboratory Experiments in Biochemistry*. I. 2 hr. PR: Ag. Bi. 310 or concurrent enrollment. Experiments to demonstrate some of the basic tools and procedures of biochemical research.
- 312. *General Biochemistry*. II. 3 hr. PR: Ag. Bi. 310 or consent. Continuation of Ag. Bi. 310.
- 314. *Radionuclide Biochemistry*. II. 3 hr. PR: Chem. 1, 2, 131, or consent. Radionuclide methods and isotope handling as needed by students interested in biological research.
- 318. *Amino Acid Biochemistry*. I. 2 hr. PR: Ag. Bi. 312, or consent. Properties, reactions, biosynthesis, and intermediary metabolism of amino acids.

410. *Biochemistry of Carbohydrates*. I. 3 hr. PR: Ag. Bi. 312 or consent. Chemical properties, occurrence in foods and wastes, digestion, nutritional significance, and metabolism of carbohydrates. (*Offered in Fall of odd years.*)
414. *Enzymes*. II. 3 hr. PR: Ag. Bi. 312, or consent. General survey of the chemistry of enzymes for advanced students.
415. *Advanced Biochemistry Laboratory*. II. 2 hr. PR: Ag. Bi. 312 or concurrent enrollment. Application of modern biochemical techniques to experimentation in animal and plant metabolism.
416. *Vitamins*. I. 2 hr. PR: Ag. Bi. 312 or consent. Identification, nomenclature and chemical structures, biochemical systems, biogenesis, pathology, and requirements of vitamins and vitamin-like compounds. (*Offered in Fall of odd years.*)
418. *Mineral Metabolism*. I. 3 hr. PR: Ag. Bi. 312 or consent. The inorganic chemistry and biochemistry of the minerals in the body and the physiological function of minerals are studied. Special term paper is required on the chemical metabolism studies. (*Offered in Fall of even years.*)
422. *Plant Biochemistry*. I. 3 hr. PR: Ag. Bi. 312 or consent. Advanced treatment of composition and metabolism of plants. (*Offered in Fall of odd years.*)
450. *Seminar*. I, II. 1 hr. per sem.
491. *Advanced Study*. I, II, S. 1-6 hr. PR: Consent. Investigation of advanced subjects not covered in regularly scheduled courses. Study may be independent or through specially scheduled lectures.
497. *Research*. I, II, S. 1-15 hr.

ANIMAL AND VETERINARY SCIENCES

The Division offers a master of science program in animal science and a doctor of philosophy program in animal nutrition. The Division participates in interdivisional master of science and doctor of philosophy programs in agricultural biochemistry and in intercollege programs in genetics and reproductive physiology.

The master of science program in animal science allows maximum flexibility in courses and research problems. Students may work with beef and dairy cattle, sheep, swine, poultry, or laboratory animals. They may emphasize physiology, pathology, production, breeding, or nutrition. Research problems in farm animals form the basis for many studies, but a comparative approach is emphasized.

Admission requirements are similar to those in other biological sciences. The student should have complete basic courses in the physical and biological sciences, including genetics, nutrition, and physiology. For the program in animal nutrition, analytical chemistry and organic chemistry (one year) are required. Deficiencies may prolong the time needed to complete degree programs.

The minimum undergraduate grade-point average for admission shall be either 2.75 overall or 3.0 for the last 60 hours of undergraduate work. A composite GRE score of 1,000 or better will be considered as a basis of admission. The fact that an applicant meets one or more of the above requirements shall not guarantee admission since each professor will accept only the number of advisees which can be supervised adequately with available facilities, time, and funds.

Twenty-four approved hours of course work and a thesis are required for all master of science degrees. The doctoral programs are governed by the Graduate School general regulations.

Animal and Veterinary Science

A&VS

491. *Special Topics*. I, II, S. 1-4 hr. (1 hr. credit in special cases only). Advanced study in particular phases of such animal science topics as animal production, nutrition, physiology, breeding and genetics, veterinary science, and food science. (For the Master's Degree, Special Topics ordinarily may count 2 to 4 hr; max. credit, 6 hr.).
497. *Research*. I, II, S. 1-15 hr. Research in animal nutrition, physiology, breeding and production and veterinary science.

Animal Nutrition

An. Nu.

294. *Poultry Nutrition*. II. 3 hr. PR: An. Nu. 101. Nutritional requirements, interrelationships, and deficiencies of all types of domesticated fowl.
301. *Principles of Nutrition and Metabolism*. I. 3 hr. PR: Ag. Bi. 210, or consent. A basic course in principles of nutrition with emphasis on the major classes of dietary nutrients and their digestion and utilization.
302. *Nutrition and Physiological Function*. II. 3 hr. PR: An. Nu. 301 or consent. Sequence to An. Nu. 301. Techniques used in nutritional studies and the relationship of nutrient requirements to physiological function in species of laboratory and domestic animals and man.
304. *Nutrition Laboratory Methods*. II. 2 hr. PR: An. Nu. 301 and consent. Diet preparation, food analysis, management of laboratory animals, demonstration of specific nutrient deficiencies and the conduct and analysis of animal feeding trials designed to examine the nutritional properties of experimental diets.
491. *Advanced Studies*. I, II, S. 1-6 hr. Topics in advanced nutrition. Subject will be selected by staff for formal presentation. Repeat registration permitted for maximum of 6 credit hours per year.
496. *Seminar*. I, II. 1 hr.

Animal Physiology and Breeding

An. Ph.

204. *Animal Physiology Laboratory*. I. 2 hr. PR: An. Ph. 100 or consent. Laboratory study of the physiological systems of animals and the influences of environment on these systems.
225. *Physiology of Reproduction*. II. 3 hr. PR: Course in biology. Comparative physiology of reproduction in higher animals; endocrine functions involved in reproduction; genetic and environmental variations in fertility mechanisms.
226. *Breeding of Farm Animals*. I. 3 hr. PR: Course in genetics or consent. Application of principles of quantitative genetics to the improvement of farm animals.
280. *Behavioral Patterns of Domestic Animals*. II. 3 hr. (1 lab.). Examination of the bases for exhibition and control of behavioral patterns of domestic animals.

425. *Endocrinology of Reproduction*. II. 4 hr. (2 labs.). PR: An. Ph. 225 or Biol. 268 or equiv. Discussion of and laboratory experience in classical and current concepts of hormonal and neurohormonal regulations of reproductive phenomena with emphasis on species differences and similarities. (*Offered in Spring of odd years.*)
426. *Advanced Animal Selection*. II. 3 hr. PR: Course in Statistics and course in Genetics or equiv. An advanced course dealing with the basic concepts of experimental and statistical approaches in the analysis of quantitative inheritance with special reference to the magnitude and nature of genotypic and non-genotypic variability. (*Offered in Spring of even years.*)
496. *Seminar*. I, II. 1 hr.

Animal Production

An. Pr.

240. *Poultry Production*. I. 3 hr. (1 lab.). PR: Course in animal nutrition. Special phases of broiler and egg production, disease control, labor-saving studies, and recent designs in housing and equipment for all types of poultry.
250. *Current Literature in Animal Science*. I. 3 hr. PR: An. Nu. 101. Evaluation of current research in animal science and its application to production and management.
422. *Advanced Milk Production*. II. 3 hr. PR: An. Nu. 101 or consent. Advanced study of the feeding, breeding, and management of dairy cattle.

Food Science

Fd. Sc.

267. *Advanced Meat Science*. II. 3 hr. PR: Fd. Sc. 167. Carcass composition, the transformation of muscle to meat, and properties of meat which affect water binding capacity, pigment formation, meat texture, fiber characteristics, and meat palatability are studied. Marketing trends also are investigated.

Veterinary Science

Vet. S.

210. *Principles of Laboratory Animal Science*. I. 3 hr. (1 lab.). PR: Consent for undergraduates. The management, genetics, physiology, nutrition, disease, and germ-free quartering of common laboratory animals.
305. *Parasitology*. II. 3 hr. PR: Course in biology. Common parasites of farm animals, their control, and their effect upon the host. (*Offered in Spring of odd years.*)

DIVISION OF FORESTRY

Master of Science in Forestry

Students seeking admission to the program leading to the degree of Master of Science in Forestry should have completed an undergraduate curriculum in forestry similar to that offered at WVU, and should have an academic record well above average. A student whose undergraduate degree is in a field other than forestry will ordinarily be required to take supplemental undergraduate courses. Candidates for

the degree may major in forest biometry, forest ecology, forest economics, forest genetics, forest hydrology, forest meteorology, forest management, silviculture, or wood industries management. The candidate must complete 30 credits of approved study, 6 of which shall constitute a thesis. The program ordinarily requires two years of residence.

Master of Science

(Recreation or Wildlife Management)

The Division offers programs leading to the degree of Master of Science for students who wish to major in recreation or wildlife management. Applicants should have a bachelor's degree, with good academic performance and an appropriate background in the subject matter of the chosen field. With the exception of those majoring in recreation, candidates must complete 30 credits of approved study, 6 of which shall constitute a thesis. Students majoring in recreation have the option of earning the degree on the basis of 30 hours with a thesis or 36 hours without a thesis. These programs ordinarily require two years of residence.

Doctor of Philosophy

(Forest Resources Science)

A candidate for the Doctor of Philosophy degree in Forest Resources Science may choose as the major field of study forest science, wood science, or wildlife management. Within these major fields of study, specialization is limited only by the range of competencies in the graduate faculty.

Curriculum requirements of all candidates include a block of graduate courses in the major field which will constitute a comprehensive review of the significant knowledge in that field, and a block of graduate courses in a minor area of study. A minimum of 60 semester hours beyond the bachelor's degree and exclusive of the dissertation will be required.

The research work for the doctoral dissertation must show a high degree of scholarship and must present an original contribution to the field of forest resources science. In addition to course work and the dissertation, the candidate is required to pass a qualifying examination and a final examination.

Forestry

For.

- 226. *Remote Sensing of Environment*. II. 2 hr. PR: Math. 3, 4. Measurement and interpretation of natural resources and environment from photography, radar, infrared, and microwave imagery.
- 233. *Principles of Industrial Forestry*. II. 3 hr. PR: Forestry senior or consent. Analysis and case studies of problems pertinent to the integration of wood conversion technology with principles of production, marketing, and management.
- 419. *Microclimatology*. II. 3 hr. PR: Consent. A description and quantitative treatment of climate near the ground in terms of physical and physiological processes of energy and mass exchange.

- 470. *Special Topics in Forestry, Wood Science, Wildlife, or Recreation.* I, II, S. 1-6 hr.
- 474. *Seminar in Forest Hydrology and Climatology.* I, II. 1 hr. PR: Consent.
- 480. *Principles of Research.* I, II. 2 hr. The scientific method as applied in the formal, concrete, and normative sciences, with special emphasis on forestry-related research plans and reports.
- 490. *Teaching Practicum.* I, II. 1-6 hr. PR: Consent. Supervised practices in college teaching of forest resources management, wood science, wildlife management resources, and recreation and parks.
- 491. *Advanced Study.* I, II, S. 1-6 hr. PR: Consent. Investigation in advanced subjects which are not covered in regularly scheduled classes.
- 496. *Graduate Seminar.* I, II. 1 hr. PR: Consent.
- 497. *Research.* I, II, S. 1-15 hr.
- 498. *Thesis.* I, II, S. 1-6 hr. PR: Consent.
- 499. *Graduate Colloquium.* I, II, S. 1-6 hr. PR: Consent. For graduate students not seeking course work credit but who wish to meet resident requirements, use the University's facilities, and participate in its academic and cultural programs.

Forest Hydrology

F.H.

- 241. *Forest Hydrology: Principles.* II. 3 hr. PR: F.H. 142 or consent. Description and quantitative treatment of the hydrologic cycle in nature, with primary emphasis on the role of forests and terrain.
- 242. *Forest Hydrology: Practices.* I. 3 hr. PR: F.H. 241. Applications of forest hydrology and climatology in the management of forest land for optimum yields of water, and to minimize erosion, pollution and flood damage.
- 243. *Forest Water Quality.* I. 2 hr. PR: Forestry major or consent. Influences of natural forest cover, forest land uses, and harvesting practices on selected water quality parameters that can be detected in simple field and laboratory tests.

Forest Management

F. Man.

- 200. *Forest Measurement, Interpretation, Wildlife Management.* S. 5 hr. (Pass-Fail.) PR: Biol. 51; C.E. 5; F. Man. 122. Application and study of forest resources practice with emphasis on field problems. (Course will be taught during four consecutive 6-day weeks.)
- 201. *Forest Resources Management Southern Trip.* S. 1 hr. (Pass-Fail.) PR: F. Man. 200 or consent. One-week trip to Southern Pine Region to observe forest management practices on private and public lands.
- 211. *Silvicultural Systems.* I. 4 hr. PR: Forestry major or consent; F. Man. 12. Principles of regeneration cuttings, intermediate cuttings, and cultural operations, with their application to forest stands.

213. *Regional Silviculture*. I. 2 hr. PR: Forestry major or consent; F. Man. 12; PR or Conc.: F. Man. 211. Major forest types of the United States: their composition, management, problems, and silvicultural treatment.
215. *Principles of Artificial Forestation*. II. 3 hr. PR: Forestry major or consent; F. Man. 12. Seeding and planting nursery practice; phases of artificial regeneration.
216. *Forest Genetics and Tree Improvement*. II. 3 hr. PR: Forestry major or consent; Genet. 272 or equiv., or consent. Forest genetic principles and their application to forest tree improvement, including crossing methods, selection systems, and other techniques.
222. *Forest Mensuration*. II. 3 hr. PR: Forestry major or consent; F. Man. 122. Measurement of growth and yield; statistical methods applied to forest measurement problems.
230. *Principles of Forestry Economics*. I, II. 3 hr. PR: Forestry major or consent; Econ. 51 and 52 or equiv. Production, distribution, and use of forest goods and services. Emphasis on analytical methods and techniques dealing with forest economic problems.
232. *Forest Finance*. II. 2 hr. PR: Forestry junior or consent. Interest, discount, and rate earned, in forest production and exploitation. Particular reference to determining value of standing timber, appraisal of forest damages, and forest taxation.
233. *Forest Management*. I, II. 4 hr. PR: Summer Camp; PR or Conc.: Forestry major or consent; F. Man. 211. Principles of sustained yield forest management. Organization of forest area, selection of management objectives, application of silvicultural systems, and regulation of cut. Forest management plan.
234. *Integrated Forest Resources Management*. I, II. 3 hr. PR: Forestry major or consent; senior standing. Analysis and planning for management of forest resources. Primarily involves carrying out a major management problem assignment, with actual forest tracts as focal point.
330. *Advanced Principles of Forestry Economics*. II. 3 hr. PR: Econ. 51, 52 or equiv.; F. Man. 230 or equiv. Intensive study of both micro- and macroeconomics of forestry.
411. *Environmental Relationships in Hardwood Forests*. I. 3 hr. PR: F. Man. 211. Environmental factors affecting establishment, composition, and growth of hardwood forests.
412. *Silvicultural Practices for Hardwood Forest Types*. II. 3 hr. PR: F. Man. 211, 213. Designing proper silvicultural systems for managing Appalachian hardwood stands; reconstructing stand histories, recognizing problems, and prescribing appropriate silvicultural treatment.
431. *Advanced Forest Regulation*. I, II. 2 hr. PR: F. Man. 233 or equiv. Intensive study of area and volume regulation suitable for applied forestry in the United States.
472. *Seminar in Silviculture*. I, II. 1-6 hr. per sem.; max. credit, 4 hr. PR: Consent. Reports and discussions of recent research in fundamental and applied phases of silviculture with emphasis on hardwood forest types.
473. *Seminar in Forest Management*. 1 hr.

Wood Science

Wd. Sc.

200. *Forest Measurement Field Practice*. S. 3 hr. (Pass-Fail.) PR: Forestry major, Biol. 51, C.E. 1, F. Man. 122. Application of surveying and mensurational practices with emphasis on field problems.
201. *Wood Industries Field Trip*. S. 2 hr. (Pass-Fail.) PR: Wd. Sc. 234. A two-week trip to observe manufacturing methods and techniques of commercial wood industry plants. Plants visited include furniture, plywood, veneer, hard-board, particle-board, pulp and paper, sawmilling, and preservation. (*Offered in odd years.*)
230. *Wood Machining*. II. 2 hr. PR: Consent. Introduction to basic concepts of wood machining with emphasis on production equipment and furniture manufacturing.
231. *Wood Finishing*. I. 3 hr. PR: Forestry major or consent; Wd. Sc. 121. Surface preparation, composition of finishing materials, equipment, techniques, defects, troubleshooting, and quality control.
232. *Wood Adhesion: Theory and Practice*. I. 2 hr. PR: Wd. Sc. 123 and 141. Detailed theoretical introduction and examination of different types of adhesives and gluing techniques used in the wood industry.
234. *Statistical Quality Control*. II. 3 hr. PR: Forestry major or consent; Wd. Sc. 134. Methods used to control quality of manufactured wood products. Control charts of variables and attributes. Acceptance sampling techniques. (*Offered in Spring of odd years.*)
235. *Light-Frame Wood Construction*. I. 2 hr. PR: Forestry major or consent. Use of wood in light-frame construction. Basic design procedures and construction methods.
240. *Wood Moisture Relationships*. II. 3 hr. PR: Forestry major or consent; Wd. Sc. 123. Principles involved in the relation between wood and moisture, and purposes, effects, and methods of seasoning.
251. *Forest Products Protection*. I. 3 hr. PR: Forestry major or consent; Wd. Sc. 123, 134. Biological organisms responsible for deterioration of wood products, their control by preservative methods, and study of fire retarding methods.
320. *Wood Microstructure*. I. 3 hr. PR: Wd. Sc. 123; senior standing, or consent. Detailed examination of wood microstructure as it relates to processing, behavior, and identification.
473. *Seminar in Wood Utilization*. I, II. 1 hr. per sem.; max. credit, 4 hr. PR: Consent. Reports and discussions of recent research in fundamental and applied phases of wood utilization.

Wildlife Management

W. Man.

213. *Wildlife Ecology*. I. 4 hr. PR: Wildlife major or consent; Biol. 1 and 2. Basic principles of ecology and their application to wildlife. Field and laboratory studies of major ecosystems important to wildlife, including management of these ecosystems for wildlife.

222. *Field Ornithology*. S. 3 hr. PR: Biol. 1 and 2 or consent. Intensive field studies in recognition through sight, song, and behavioral patterns of birds, and their ecology in the central Appalachians. (Course taught at Terra Alta Biological Station.)
224. *Forest Zoology 1*. I. 3 hr. PR: Biol. 2 or consent. Relationships of fish and amphibians to the forest, with emphasis on the ecology, taxonomy, evolution, natural history, and field identification of these groups. Laboratory emphasizes natural history and anatomy of fish and amphibians.
225. *Forest Zoology 2*. II. 3 hr. PR: Biol. 2 or consent. Relationships of reptiles and mammals to the forest, with emphasis on ecology, taxonomy, evolution, natural history, and field identification of these groups. Laboratory emphasizes natural history and anatomy of reptiles and mammals.
231. *Wildlife Techniques*. I. 3 hr. PR: Wildlife major or consent; W. Man. 213, Biol. 151. Field and laboratory techniques necessary in management and study of wildlife; collection of field data, mapping, censusing, habitat evaluation, literature and scientific writing.
234. *Principles of Wildlife Management*. II. 3 hr. PR: Wildlife major or consent; W. Man. 213. Major game animals and problems and principles involved in their management.
312. *Wildlife Population Ecology*. II. 3 hr. PR: W. Man. 131, Stat. 211, or equiv. Theory of population growth, population change, intraspecific and interspecific relationships involved in natural regulation of populations, and effects of exploitation on wildlife populations.
370. *Wildlife Seminar*. II. 1 hr. per sem.; (4 hr. max.). PR: Consent. Discussion of current developments in wildlife management.
434. *Ecology and Management of Upland Wildlife*. II. 4 hr. PR: Consent. Ecology and management of upland game birds and mammals, with emphasis on recent literature.
436. *Ecology and Management of Wetland Wildlife*. II. 4 hr. PR: Consent. Ecology and management of waterfowl and wetland furbearers with emphasis on recent research and management literature.

Recreation and Parks

Rc. & Pk.

201. *Wildland Search and Rescue Techniques*. I. 2 hr. PR: Consent. Acquaints future forest, park, and recreation area professionals with the safe methods, practices, and procedures of search and rescue of lost and/or injured persons. Some weekend field trips required.
202. *Recreation Internship*. I. 3 hr. PR: Rc. & Pk. 43, 44, 265; Recreation major or consent. A supervised, full-time recreation leadership responsibility for a minimum of 8 weeks. Position approval in advance. Comprehensive written analysis prepared following internship field experience.
233. *Wildland Recreation Administration*. I. 3 hr. PR: Recreation junior standing or consent. Introduction to administration and management problems associated with providing recreation in wildland areas.
235. *Administration of Urban and Regional Recreation Services*. I. 3 hr. PR: Recreation major, Rc. & Pk. 43, 44 and 265 or consent. Administration of recreation and parks agencies, including legal foundations and responsibilities, organizational structures, personnel, finance, and services.

241. *Recreational Services for Special Populations*. I. 3 hr. PR: Consent. Introductory analysis of current therapeutic broadening recreation and park services to include members of special populations; familiarization with the planning consideration for the conduct of such services.
242. *Historical and Cultural Interpretation*. II. 3 hr. PR: Recreation major or consent. Methods of locating source materials for reconstructing the historical, cultural, and physical aspects of an area for an interpretive center; preparing brochures, displays, and nature trails to facilitate interpretive activities.
251. *Recreation Leadership*. I. 3 hr. PR: Recreation major or consent. Leadership, its application to recreation, and analysis of techniques. Examination of social group work method and its application, particularly in national youth organizations.
263. *Program Planning*. II. 3 hr. PR: Recreation major or consent; Rc. & Pk. 1. Fundamentals for general program planning; considers needs, facilities, age groups, local customs, climatic factors, etc. Planning involved in playgrounds, indoor centers, playfields, parks, hospitals, voluntary agencies, industry, and camps.
265. *Functional Planning of Recreation and Park Facilities*. II. 3 hr. PR: Recreation major or consent. Lecture and workshop. Problems and principles governing planning for functional and effective use of recreation facilities. Emphasis on playgrounds, playfields, indoor centers, parks, camps, and swimming pools.
271. *Administration of Camping Services*. II. 3 hr. PR: Recreation major or consent; Rc. & Pk. 40 or equiv. Principles involved in modern camping programs, and organization and administration of camps.
272. *Professional Synthesis*. II. 3 hr. PR: Recreation major or consent; senior standing, last semester of professional education, 16 hr. professional courses in recreation and parks management. A "capstone" course which requires the student to synthesize professional training into analysis and solution of a special problem in the student's option of Recreation and Parks Management.
316. *Philosophy of Recreation*. II. 3 hr. PR: Consent. Interpretation of recreation as a basic part of the living process; importance to individual community and national welfare; social and economic significance.
324. *Outdoor Recreation in Our Modern Society*. II. 3 hr. PR: For persons in recreation, park, outdoor education and conservation, or consent. Interpretation as to what outdoor recreation is, what people do, where they go, how this affects our economic, social, and cultural life, and significant trends.
348. *Outdoor Education and School Camping*. II. 3 hr. PR: For majors in education, recreation, extension, forestry, or consent. Interpretation and programing outdoor recreation.
408. *Practicum in Recreation*. I, II. 4 hr. PR: Rc. & Pk. 472, PESE 396, 397. Program planning, curriculum development, and job functions in recreation.
415. *Leisure and Recreation*. I. 3 hr. PR: Consent. Study of leisure as a social phenomenon and its implications for recreation.
421. *Human Interest Areas in Recreation Planning*. I. 3 hr. PR: Rc. & Pk. 316 or 20 hr. in Education or equiv. Exploration of human interest areas which are sources of recreation program content; their adaptation to school and municipal recreation program planning.

462. *Community Recreation*. I. 3 hr. PR: Rc. & Pk. 316 or consent. Study of problems related to providing adequate recreation services for a community. Standards and quality of recreation service; methods of measuring existing services and their coordination; community organization procedures. For leaders in voluntary agencies, schools, churches, and municipal recreation organizations.
472. *Seminar in Recreation*. I, II. 4 hr. PR: Rc. & Pk. 316. Overview and critical analysis of literature and research in recreation.

DIVISION OF PLANT SCIENCES

The Division of Plant Sciences offers the Master of Science (M.S.) degree with majors in Bacteriology, Crop Science, Soil Science, Horticulture, Microbiology, and Plant Pathology, and the Doctor of Philosophy (Ph.D.) degree with majors in Crop Science, Soil Science, Agricultural Microbiology, and Plant Pathology. In addition, M.S. and Ph.D. degrees are offered cooperatively in an inter-college program with a major in Genetics and in Developmental Biology, and with the Division of Animal and Veterinary Sciences with a major in Agricultural Biochemistry.

Facilities for graduate research include several farms, greenhouses, growth chambers, and modern laboratories.

The student must have a bachelor's degree from any approved college and an adequate background in the physical and biological sciences. Additional undergraduate work may be required according to the needs of the field of specialization by the student. The courses required for graduate study will vary with the major, and are developed in consultation with the student's adviser and advisory committee.

A candidate for the master's degree must pass satisfactorily 30 hours of approved work, of which 6 hours may be for a thesis. A thesis is required. Admission to candidacy for the Ph.D. degree is conditioned upon a suitable period of residence and demonstrated ability to do work of graduate caliber; this is usually established by passing a qualifying examination given by the faculty in his field of study.

The general regulations of the Graduate School apply to all programs of graduate study in the Division of Plant Sciences.

Plant Science

Plant Sci.

200. *Recognition and Diagnosis of Plant Disorders*. I. 4 hr. PR: Plant Path. 201 and Entom. 204. Creates an ability for the student to use systematic inspection to determine cause or causes of a plant disorder.
201. *Principles and Methods of Plant Pest Control*. II. 4 hr. PR: Plant Path. 201 and Entom. 204. Concepts of control and how they are implemented by exclusion, eradication, protection, and immunization.
420. *Special Topics*. I, II, S. 2-6 hr. Special study in agricultural microbiology, crop science, entomology, horticulture, plant pathology, or soil science.
450. *Seminar*. I, II. 1 hr. Graduate seminar in agricultural microbiology, crop science, horticulture, plant pathology, or soil science.

497. *Research*. I, II, S. 1-15 hr. Graduate research in agricultural microbiology, crop science, horticulture, plant pathology, or soil science.

Agronomy (Crop Science)

Agron.

250. *Turfgrass Management*. I. 3 hr. PR: Agron. 2, or consent. Establishment, maintenance, and adaptation of grasses and legumes for lawns, golf courses, parks, athletic fields, and roadsides. Associated differential plant responses with soil, climatic, and biotic factors. Field trips arranged.
251. *Weed Control*. I. 3 hr. PR: Plant Sci. 52, Agron. 2, or consent. Fundamental principles of weed control. Recommended control measures for and identification of common weeds. 2 lec., 1 lab. (*Offered in Fall of odd years.*)
252. *Grain and Special Crops*. II. 3 hr. PR: Plant Sci. 52, Agron. 2, or consent. Advanced study of methods in the production of grain and special crops. Varieties, improvement, tillage, harvesting, storage, and uses of crops grown for seed or special purposes. (*Offered in Spring of even years.*)
254. *Pasture and Forage Crops*. I. 4 hr. PR: Plant Sci. 52, Agron. 2, or consent. All phases of pasture and forage crop production, including identification, seeding, management, use, seed production, and storage of forage crops. 3 lec., 1 lab.

Agronomy (Soil Science)

210. *Soil Fertility*. I. 3 hr. PR: Agron. 2 or 10. Soil properties in relation to fertility and productivity of soils; evaluation of soil fertility; production of fertilizers and their use in increasing soil fertility and productivity.
212. *Soil Conservation and Management*. II. 3 hr. PR: Agron. 2 or 10. Using soil technology to solve soil management problems relating to cropping systems. Field diagnosis of soil problems stressed.
230. *Soil Physics*. II. 3 hr. PR: Agron. 2 or 10. Physical properties of soils, water and air relationships and their influence on soil productivity. (*Offered in Spring of even years.*)
301. *Geotechnic*. I. 3 hr. PR: Consent. A unified approach to various aspects of soil formation and influence of formative factors on the nature of soils and their use as engineering materials. Course serves as a common meeting ground for students in the various disciplines concerned with earth science. 3 lec. (*Offered in the Fall of odd years.*)
315. *Soil Genesis and Classification*. I. 3 hr. PR: Agron. 2 or 10. Origin and formation of soils. Study of soil profiles and soil forming processes in field and laboratory. Principles of classification and techniques of soil mapping. 2 lec., 1 lab. (*Offered in Fall of even years.*)
410. *Advanced Soil Fertility*. II. 3 hr. PR: Agron. 210, Biol. 169 or consent. Influence of soil chemical and physical properties on availability of plant nutrients; intensive study of individual plant nutrients and interactions of nutrients in soils and crops. (*Offered in Spring of even years.*)
416. *Soil Chemistry*. I. 3-hr. PR: Consent. Chemistry of soil development; chemical and mineralogical composition of soils; nature and properties of organic and inorganic soil

colloids; soil acidity; cation and anion exchange phenomena; soil chemistry of macro- and micro-nutrients. (*Offered in Fall of odd years.*)

418. *Chemistry of Soil Organic Matter*. II. 3 hr. PR: Organic chemistry or consent. Chemical composition of soil organic matter studied in relation to its physico-chemical properties and humus formation. Methods involving extraction, fractionation, and purification of soil organic components examined. 2 lec., 1 lab. (*Offered in Spring of odd years.*)
421. *Identification of Clay Minerals in Soil*. II. 3 hr. PR: Physical chemistry or consent. Characterization of clay minerals is an important aspect in soils, geology, civil engineering, and related fields. Study of methods used in qualitative and quantitative identification of these secondary minerals in soils and rocks. 1 lec., 2 lab. (*Offered in Spring of even years.*)
451. *Seminar in Micropedology*. I. 2 or 3 hr. PR: Second-year graduate and consent. Principles of optical mineralogy and of the polarizing microscope as applied to the study of soil minerals and soil fabrics. (Cross-listed as Geol. 451.) (*Offered in Fall of even years.*)

Bacteriology

Bact.

201. *Environmental Microbiology*. II. 4 hr. PR: Bact. 141 or consent. Microbiology as applied to soil, water, waste-water, sewage, air, and the general environment. Occurrence, distribution, ecology, and detection of microorganisms in these environments.
347. *Food Microbiology*. I. 4 hr. PR: Bact. 141, organic chemistry or consent. Ecology and physiology of microorganisms important in the manufacture and deterioration of foods. Techniques for the microbiological examination of foods. (*Offered in Fall of even years.*)
348. *Sanitary Bacteriology*. I. 3 hr. PR: Bact. 141. Bacteriology and health hazards associated with food handling, water treatment, and sanitary waste disposal. (*Offered in Fall of odd years.*)

Entomology

Entom.

204. *Principles of Entomology*. I. 4 hr. PR: Biol. 1 and 2 or equiv. Basic course dealing with the anatomy, morphology, physiology, reproduction, systematics, ecology, and control of insects.
420. *Special Topics*. I, II, S. 2-6 hr. PR: Entom. 204 or equiv., or consent. Each of the following courses is given every other year: Advanced Taxonomy — Exopterygota, Endopterygota Part I, Part II; Larval Taxonomy, Acarology, Economic Entomology-Pest Management, Insect Physiology, Pesticides in the Environment, and Medical Entomology.
450. *Seminar*. I, II. 1 hr. per sem.
497. *Research*. I, II, S. 1-15 hr.

Genetics

Genet.

290. *Crop Breeding*. II. 3 hr. PR: Genet. 171 or 321. Methods and basic scientific principles involved in improvement of leading cereal and forage crops through hybridization and selection. (*Offered in Spring of odd years.*)
321. *Basic Concepts of Modern Genetics*. I. 3 hr. PR: 8 hr. biological science and 1 yr. chemistry. Independent inheritance, linkage. Chemical nature of genetic material. Control of phenotype by genetic material. Gene action and coding of genetic material.
325. *Human Genetics*. II. 3 hr. PR: Genet. 171 or 321 or consent. Study of genetic system responsible for development of phenotype in man. (*Offered in Spring of even years.*)
335. *Population Genetics*. I. 3 hr. PR: Genet. 171 or 321 or consent. Relationship of gene and genotype frequencies in populations of diploid organisms, and effects of mutations, migration, selection, assortive mating, and inbreeding in relation to single gene pairs. Application of these concepts to multigenic inheritance of quantitative traits. (*Offered in Fall of even years.*)
420. *Special Topics*. I, II, S. 2-4 hr. (For the Master's Degree, Special Topics ordinarily may count 2 to 4 hr.; max. credit, 6 hr.)
424. *Cytogenetics*. II. 4 hr. PR: Genet. 171 or 321, and Biol. 215 or consent. Emphasis on macromolecules that carry information of the chromosomes, cell division, and the cytological and molecular basis of genetics. Special attention given to visible manifestations of genes, human cytogenetics, cytogenetics of genomes and chromosome morphology, and their evolution. (*Offered in Spring of odd years.*)
426. *Advanced Biochemical Genetics*. II. 3 hr. PR: Genet. 171 or 321 and organic chemistry. Physiological and biophysical concepts of genetic material. Structure and arrangement of genetic units. Nucleic acids as carriers of genetic information. Gene action and amino acid coding. Biochemical evolution of genetic material. Genetic control mechanisms. Biochemistry of mutation. (*Offered in Spring of even years.*)
427. *Genetic Mechanisms of Evolution*. I. 3 hr. PR: Genet. 171 or equiv. Molecular genetic mechanisms which result in evolutionary change. Origin of life, origin and organization of genetic variability, differentiation of populations, isolation and speciation role of hybridization and polyploidy, and origin of man. (*Offered in Fall of odd years.*)
450. *Seminar*. I, II. 1 hr. per sem. Recent literature pertaining to biochemical, classical, human, molecular and cytological genetics.
497. *Research I, II*. 1-15 hr.

Horticulture

Hort.

204. *Plant Propagation*. II. 3 hr. Study of practices of plant propagation and factors involved in reproduction in plants. (*Offered in Spring of even years.*)
242. *Small-Fruits*. I. 3 hr. (2 lec., 1 scheduled lab.). PR: Plant Sci. 52, Hort. 107, or consent. Taxonomic, physiological, and ecological principles involved in production and handling of small-fruits. (*Offered in Fall of even years.*)

243. *Physiology of Vegetables*. I. 3 hr. (2 lec., 1 scheduled lab.). PR: Plant Sci. 52. Physiological and ecological principles involved in production of vegetable crops. (*Offered in Fall of even years.*)
244. *Handling and Storage of Horticultural Crops*. II. 3 hr. (2 lec., 1 scheduled lab.). PR: Plant Sci. 52, Chem. 16. Characteristics of perishable crops. Methods and materials used to maintain quality. (*Offered in Fall of odd years.*)
245. *Greenhouse Management*. II. 3 hr. PR: Two semesters of Inorganic Chemistry and Hort. 107 or consent. Greenhouse as a controlled plant environment. How to manipulate factors influencing plant growth and development within specialized environments of greenhouses.
301. *Post-Harvest Physiology*. II. 3 hr. (1 lec., 2 labs.). Physiology and biochemistry of harvested crops. (*Offered in Spring of odd years.*)

Plant Pathology

Plant Path.

201. *General Plant Pathology*. I. 4 hr. Nature and causes of plant diseases; methods of control.
301. *Diseases of Economic Plants*. I, II, S. 1-3 hr. per sem., 2 hr. in Summer. PR: Plant Path. 201 or 303 or consent. Recognition, cause, and control of diseases of economic plants; Sem. I, Diseases of vegetable crops and of tree and small fruits; Sem. II, Diseases of ornamental plants and field and forage crops. S, Diseases of forest trees. Students may register for 1-3 hr. in Sem. I and II, 2 hr. in Summer, until 8 hours of credit are accumulated. (*Offered in 1979-80 and in alternate years.*)
302. *Principles of Plant Pathology*. II. 4 hr. PR: Plant Path. 153, 201, or 303, or consent. Primarily for graduate students and seniors majoring in biology, botany or agricultural science. Nature of disease in plants with practice in laboratory methods. (*Offered in Spring of even years.*)
303. *Mycology*. I. 4 hr. Lectures and field and laboratory studies of parasitic and saprophytic fungi.
309. *Nematology*. II. 3 hr. Primarily for graduate students majoring in the agricultural sciences or biology. Nematode taxonomy, bionomics, and control, with particular emphasis on plant parasitic forms. (*Offered in Spring of odd years.*)
402. *Physiology of Plant Diseases*. I. 2 hr. PR: Ag. Bi. 291 and Plant Path. 302, or consent. Study of host-parasite interactions, with emphasis on physiological and biochemical changes that occur in higher plant tissues in response to pathogenic organisms. (*Offered in Fall of even years.*)
430. *Physiology of the Fungi*. II. 4 hr. PR: Organic chemistry, mycology, and bacteriology, or consent. Physiological aspects of growth, reproduction, and parasitism of fungi, with emphasis on nutrition, environment, and other biotic factors. (*Offered in Spring of even years.*)
440. *Taxonomy of the Fungi*. S. 3 hr. PR: Plant Path. 303. Collection and identification of fungi with emphasis upon those of economic importance. (*Offered in odd years.*)

DIVISION OF RESOURCE MANAGEMENT

The Division is composed of four committees: Agricultural Economics, Agricultural Education, Agricultural Engineering, and Landscape Architecture. Graduate courses in Agricultural Mechanics and Landscape Architecture are offered to serve the needs of students who are seeking their master of science degree in other fields or those who are candidates for the Master of Agriculture degree. The Division Admissions Committee reviews and evaluates all applicants for graduate work in the Division.

Agricultural Economics

The faculty in agricultural economics offers major work for the degree of Master of Science in Agricultural Economics. Economics and agricultural economics faculties cooperate in offering a Ph.D. degree in economics. (See the College of Business and Economics section for details.)

Master of Science

Students are urged to seek approval from the Admissions Committee for one of the options listed below at the time they begin work. In all cases, approval must be obtained before completion of 18 hours of course work. Students expecting to become professional agricultural economists or who hold research assistantships should seek approval of Option A. Those intending to pursue careers in agricultural business may seek approval of Option B.

Requirements for Admission

Students may be accepted for graduate study in agricultural economics on a regular or provisional basis. Students meeting all the following requirements are admitted as regular students:

1. A bachelor's degree.
2. Twelve or more semester credits in economics, agricultural economics, statistics, or appropriate social science courses.
3. A grade-point average of 2.5 for all credit in economics and agricultural economics.

Students not meeting the above minimum requirements may petition for admission on a provisional basis. The Admissions Committee will set requirements for removing provisional status in each case. Failure of a student to fulfill the terms of provisional admission shall result in automatic suspension.

Persons requesting transfer of graduate credit from courses outside Agricultural Economics must obtain approval of the Admissions Committee for such transfer. The average for such courses transferred must be no less than 2.5. Such petitions must include all courses appropriate to the degree; courses with low grades will not be omitted.

Options of Study

A. Thesis Option — A minimum of 30 credit hours of approved work to include not more than 6 hours of credit for the thesis, and enough courses to provide proficiency in economics and agricultural economics. Courses in closely related social sciences may be included.

B. Course Work Option — A minimum of 36 credit hours of approved course work to provide proficiency in economics and agricultural economics. Courses in closely related social sciences may be included.

Standards of Achievement

A minimum grade-point average of 3.0 is required for all graduate credit courses taken as part of the approved program for the degree. This includes graduate credit transferred from within the University and graduate credit accumulated while pursuing a degree in agricultural economics.

Students who have earned a grade-point average of 2.75 or more with 12 or more hours of graduate credit will be admitted to candidacy. Those who do not attain this level will be placed on probation.

Examinations

Thesis Option. Satisfactory completion of an oral examination and, at the discretion of the student's graduate committee, a written examination.

Course Work Option. Satisfactory completion of a written and an oral examination.

Resource Management

491. *Advanced Study.* I, II, S. 1-6 hr. PR: Consent.

496. *Graduate Seminar.* I, II, S. 1 hr. PR: Consent.

497. *Research.* I, II, S. 1-15 hr.

Agricultural Economics

Ag. Ec.

(Economics 51 or 54 is required as a prerequisite for all graduate courses offered in Agricultural Economics.)

200. *Land Economics.* II. 3 hr. Classification, development, tenure, use, conservation, valuation, and taxation of rural, urban, mineral, forest, water, and recreational land resources. Private and public rights in land and the effect of population on the demand for land.

206. *Farm Planning.* I. 3 hr. PR: Senior standing. Planning use of labor, soil, crops, livestock, buildings and equipment; principal factors influencing returns on farms. Farm visits required.

211. *Rural Economic Development.* I or II. 3 hr. Resource utilization, economic behavior and economic systems and subsystems, trade, public revenue and its allocation, distribution of income, manpower problems, development policies, and regionalization in rural areas.

231. *Marketing Agricultural Products.* I or II. 3 hr. Market organization, policies, practices, and factors affecting the marketing of agricultural products. Tour of market agencies and facilities in Pittsburgh area required.

235. *Marketing Dairy Products.* II. 2 hr. Milk-marketing policies and practices, including milk-market orders. (Offered in Spring of odd years.)

240. *Agricultural Prices.* I or II. 3 hr. Analysis of price-making forces which operate in the market places for the major agricultural commodities.

261. *Agribusiness Finance*. II. 3 hr. Credit needs for agricultural businesses, financing farm and market-agency firms, and organization and operation of credit agencies which finance agricultural business firms.
271. *Agricultural Policy*. II. 3 hr. Examination of economic aspects of governmental price programs, production and marketing controls, subsidies, parity, export and import policies, and other programs affecting agriculture.
330. *Cooperative Organization*. II. 3 hr. Organization, functions, and contributions of cooperatives in an economic system. (*Offered in Spring of even years.*)
342. *Advanced Agricultural Economics*. I. 3 hr. Current policies, problems, and programs affecting agricultural development and food production and distribution in developing countries and the United States with emphasis on analysis of projects. (*Offered in Fall of even years.*)
355. *Resource Analysis*. I. 3 hr. PR: Senior standing. Construction of models consistent with economic reality for allocating the factors of production available on farms, in forests, and in non-farm agricultural businesses to produce profit maximizing plans through use of linear and dynamic programming and electronic equipment.
431. *Advanced Agricultural Marketing*. II. 3 hr. PR: Consent. Structure of agricultural marketing; economic theory as applied to agricultural marketing with emphasis on theoretical and practical applications.
440. *Advanced Farm Management*. I. 3 hr. (*Offered in Fall of odd years.*)
441. *Production Economics*. I or II. 3 hr. PR: Consent. Economic principles of production with special application to agriculture.

Agricultural Education

Candidates for the Master of Science degree in Agricultural Education may be accepted on a regular or provisional basis. To be admitted as a regular graduate student, the following requirements must be met: 1. A Bachelor's degree. 2. A grade-point average of 2.5 on all undergraduate work. Students not meeting the regular admission status may petition the admissions committee for entrance under one of the alternate categories in Part 2.

Students shall combine graduate courses in agriculture and in education by taking 16 to 20 hours in agriculture and 10 to 14 hours in education. All graduate courses offered toward a degree must be approved by the student's adviser. The student and adviser shall arrange a specific curriculum to be pursued for the degree at the beginning of the graduate program. A thesis is required as a part of the 30 hours for graduation.

Students shall complete in residence 15 hours of course work after having completed one or more years of teaching vocational agriculture. This shall apply unless the student has been granted permission by the Admissions Committee to complete graduate work without teaching experience.

Agricultural Education

Ag. Ed.

260. *Principles of Cooperative Extension*. I. 2 hr. PR: Consent. Background, philosophy, and history of cooperative extension. Activities of county cooperative extension

agents and cooperative extension programs in West Virginia. (*Offered in Fall of even years.*)

261. *Methods and Materials in Extension Education*. II. 2 hr. PR: Consent. Organization and preparation for extension teaching and the processes of communication. (*Offered in Spring of odd years.*)
263. *Teaching Young, Adult Farmer, and Off-Farm Agricultural Occupations Classes*. I. 2 hr. PR: Ed. Psych. 105, 106 or consent. Participation in conducting young farmer, adult farmer, and off-farm agricultural occupations classes; organization, course of study, method in teaching, and supervision of classes, young farmers' associations, adult farmers' organizations and off-farm agricultural occupations organizations. (Also listed as C&I 263.)
264. *Cooperative Vocational Education*. II. 4 hr. PR: Consent. Preparation for planning, organizing, and conducting high school programs of cooperative vocational education, and familiarization with business organization and operation. (Also listed as C&I 264.)
362. *Program Building in Cooperative Extension*. II. 3 hr. PR: Consent. Organization in relation to program building. Leadership and group action. Overall working and educational objectives, principles, method, and goals in developing county extension programs. (*Offered in Spring of even years.*)
364. *Organizing and Directing Supervised Farming and Supervised Occupational Experience Programs*. S. 2 hr. PR: Ag. Ed. 160 or consent. Planning programs of supervised farming and supervised occupational experience, supervising and evaluating such programs for day students, young farmer, adult farmer, and off-farm agricultural occupations classes and groups. (Also listed as C&I 364.)
460. *Planning Programs and Courses for Vocational Agriculture Departments*. S. 2 hr. PR: Ag. Ed. 160, 188. Gathering data, studying farming and off-farm agricultural occupations problems of day students, young farmers, adult farmers, and off-farm agricultural occupational groups and formulating total programs for school communities. (Also listed as C&I 460.)
492. *Seminar*. I, II, S. 1-3 hr. Overview and analysis of problems, literature, and research in agricultural education.

Agricultural Mechanics

Ag. Me.

253. *Advanced Farm Machinery*. II. 3 hr. Systems approach to selection, use, and operation of machinery as related to agriculture, forestry, and other rural activities. Emphasis on safety and environmental impact. Use of records for management decisions, purchase, replacement, sale, or overhaul. 2 hr. rec., 3 hr. lab.
259. *Farm Structures*. II. 3 hr. Study of structures required for agriculture, family housing, storage, and recreation. Includes function, planning, layout, materials, construction techniques, prefabrication, repair, remodeling, and costs. 2 hr. rec., 3 hr. lab.
270. *Electricity in Agriculture*. II. 3 hr. Study of production and safe use of electricity for home and agriculture. Emphasis on approved wiring practices, motors, and electrical controls and their applications in lighting, heating, refrigeration, air conditioning, water supply, and processing. 2 hr. rec., 3 hr. lab.
275. *Agricultural Engines*. I. 3 hr. Study of power sources (gasoline, diesel, turbine, wankel, etc.) for agriculture, forestry, and other rural activities. Operation, selection,

record keeping, maintenance techniques, emissions impact on power and fuel efficiency, power trains, transmissions, and service procedures. 2 hr. rec., 3 hr. lab.

352. *Advanced Farm Mechanics*. S. 3 hr. PR: Ag. Me. 152. Development of advanced skills with hand and power tools. Areas of emphasis dependent upon needs of individual students. Care and maintenance of power tools and shop organization and planning are essential parts of this course. 1 hr. rec., 6 hr. lab. (*Offered Summer of every third year — next offering 1978.*)

Landscape Architecture

L. Arc.

229. *Landscape Architecture*. I. 3 hr. (For non-majors only.) An appreciation of basic principles of design and information pertaining to use and care of ornamental plants around the house.
248. *Design Analysis*. II. 2 hr. PR: Consent. Analysis of planning and design projects with respect to offering solutions to a given problem. (*Offered in Spring of odd years.*)
250. *Advanced Landscape Architectural Design 1*. I. 6 hr. PR: L. Arc. 132 and 151. Advanced landscape design of semipublic and public areas involving comprehensive problems and in-depth individual and team study.
251. *Advanced Landscape Architectural Design 2*. II. 6 hr. PR: L. Arc. 250. Continuation of L. Arc. 250, culminating in a comprehensive final design project.
265. *Regional Design*. II. 3 hr. PR: Consent. Consideration of regional landscapes in order to effectively relate design to the ecology and development of a region. (*Offered in Fall of odd years.*)
276. *Recreation Planning*. I, II. 3 hr. PR: Consent. (I — L. Arc. majors only; II — non-majors only.) Design of park and recreation areas involving park history, classification theory, and administration.
284. *Professional Practice*. II. 3 hr. PR: Consent. Procedures in preparation of contract documents, fees, estimates, operation of an office, and relationship to clients and contractors.

Arts and Sciences

BIOLOGY

The Department of Biology offers work leading to the degrees of Master of Science and Doctor of Philosophy in biology. The department has certain requirements in addition to those of the Graduate School. Information concerning the graduate programs may be acquired by writing the Chairman, Department of Biology, before seeking admission. Students may enroll in graduate courses and may work toward an advanced degree only with the approval of the department.

Applicants are expected to have a broad foundation of training in biology and related sciences, particularly chemistry, mathematics, and physics. The applicant also is expected to present Graduate Record Examination scores and three letters of recommendation for evaluation. Deficiencies in undergraduate training may prolong the time for completion of required program for advanced degrees.

A summer field station, Terra Alta Biological Station located at Terra Alta, Preston County, offers two summer sessions for course work and research. Write to Department of Biology for descriptive folder.

The Wallops Island Marine Science Center at Wallops Island, Va. is available for selected graduate courses in marine biology. Research opportunities at the M.S. and Ph.D. level are also available in marine biology. Contact the Marine Science Director, Department of Biology, for information.

Biology

Biol.

- 201. *History of Biology*. I. 3 hr. PR: Biol. 1 and 2 or equiv. History of development of biological knowledge, with philosophical and social backgrounds.
- 209. *Topics and Problems in Biology*. I, II, S. 1-4 hr. PR: Consent. Topics and problems in contemporary biology. All topics or problems must be selected in consultation with instructor.
- 211. *Life Cycle of the Cell*. I. 4 hr. PR: Biol. 104. Advanced study of fundamental cellular activities and their underlying molecular processes. (*Course will not be offered in 1978-79.*)
- 215. *Cytology*. II. 4 hr. PR: Biol. 1 and 2 or equiv. Cells, their structure and function.
- 231. *Behavior of Organisms*. I. 4 hr. PR: Biol. 1 and 2, Psych. 1 or equiv. Principles of individual and group behavior.
- 232. *Physiological Psychology*. I. 3 hr. PR: 9 hr. psychology, behavior, physiology, or graduate standing. Introduction to physiological mechanisms and the neural basis of behavior. (Also listed as Psych. 232.)
- 235. *Primate Behavior*. II. 3 hr. PR: Consent. Primates as they exist in their natural habitats, as they suggest clues to human behavior and the evolution of behavior. Case studies and comparative primate behavior of prosimians to monkeys, to apes, to human hunters and gatherers. (Also listed as S.A. 257.)
- 243. *Plant Ecology*. I. 4 hr. PR: Biol. 1 and 2 or equiv. Environmental and ecological relationships of plants.
- 246. *Limnology*. I. 4 hr. PR: Biol. 103 or consent. Physical, chemical and biological characteristics of inland waters with an introduction to the principles of biological productivity.
- 251. *Principles of Evolution*. I, S. 3 hr. PR: Biol. 1 and 2 or equiv. Introduction to the study of evolution.
- 252. *Flora of West Virginia*. II, S. 3 hr. PR: Biol. 1 and 2 or equiv. Consideration of the native plant life of the state.
- 253. *Plant Anatomy*. I. 4 hr. PR: Biol. 1 and 2 or equiv. Anatomy of seed plants. (*Offered only in Fall of odd years.*) (*Course will not be offered in 1978-79.*)
- 254. *Plant Geography*. II, S. 3 hr. PR: Biol. 1 and 2 or equiv. Study of plant groupings and worldwide distribution of plants. (*Course will not be offered in 1978-79.*)
- 255. *Invertebrate Zoology*. II. 4 hr. PR: Biol. 1 and 2 or equiv. Advanced study of animals without backbones.

256. *Ornithology*. II. 3 hr. PR: Biol. 1 and 2 or equiv. Lecture and laboratory studies on ancestry, evolution, topography, anatomy and physiology, systematics, behavior, migration, and ectoparasites of birds. Field studies will be limited in scope. (*Course will not be offered in 1978-79.*)
257. *Ichthyology*. I. 3 hr. PR: Biol. 101 or consent. Internal and external structure of fishes, their systematic and ecological relationships, and their distribution in time and space. (Dissection kit required.)
258. *Mammalogy*. II. 3 hr. PR: Biol. 103 or W. Man. 224 and consent. Mammals and their biological properties with emphasis on life history, ecology, and distribution of regional forms. (*Course will not be offered in 1978-79.*)
259. *General Parasitology*. I. 4 hr. PR: Biol. 1 and 2 or equiv. Introduction to the biology of parasites. (Dissection kit required.) (*Course will not be offered in 1978-79.*)
260. *Plant Development*. I. 4 hr. PR: Biol. 102, organic chemistry or biochemistry, or consent. Experimental studies of plant growth and development. (*Course will not be offered in 1978-79.*)
261. *Comparative Anatomy*. I. 5 hr. PR: Biol. 101 or equiv. A comparative study of the morphology of selected vertebrates emphasizing functional and evolutionary relationships. (Dissection kit required.)
262. *Vertebrate Embryology*. II. 5 hr. PR: Biol. 1 and 2, 101 or equiv. Experimental and descriptive approach to the study of the development of vertebrates.
263. *Vertebrate Microanatomy*. II. 5 hr. PR: Biol. 101 or 261 and consent. Structural and functional approach to the study of tissues and organs of vertebrates.
265. *Comparative Neuroanatomy*. II. 4 hr. PR: Biol. 101 or 261 and consent. Comparative study of development and anatomy of the nervous systems of the vertebrates. (Dissection kit required.) (*Offered only in Spring of odd years.*) (*Course will not be offered in 1978-79.*)
266. *Human Physiology*. I, II, S. 4 hr. PR: Biol. 1 and 2 or consent. Introductory course in the function of man.
268. *Physiology of the Endocrines*. I. 3 hr. PR: Biol. 101 or 266, or equiv., organic chemistry or consent. Regulation of the organs of internal secretions, and mechanisms of action of the hormones produced.
269. *Physiology of the Endocrines — Laboratory*. I. 1 hr. PR or Conc.: Biol. 268. Experimental techniques used in study of the endocrine system.
309. *Topics and Problems in Biology*. I, II, S. 1-4 hr. PR: Consent. Topics and problems in contemporary biology, to be selected in consultation with instructor.
311. *Biology Seminar*. I, II. 1 hr. Discussions and presentations of general interest to biologists.
315. *Molecular Basis of Virology*. I. 3 hr. PR: Biol. 104 or consent. Lectures on bacterial, animal, and plant viruses; their structure, replication, and interaction with host cells. Discussion of the contributions virology has made to the understanding of molecular mechanisms in biology. (*Offered in Fall of odd years.*)
331. *Principles of Animal Behavior*. II. 4 hr. PR: Biol. 231 or equiv. Concepts in ethology and the principles governing interactions between animals. A comparative approach to animal behavior.

332. *Physiological Mechanisms of Animal Behavior*. II. 3 hr. PR: Biol. 231, 232, 331 or equiv. Explores the way behavior is controlled in a wide variety of animals so that commonalities and varieties of neural and endocrine mechanisms may be better understood. (Also listed as Psych. 332.)
333. *Behavioral Ecology*. II. 4 hr. PR: Biol. 103 and 231 or consent. Discussion of the influences of external environmental factors on regulation and control of behavior.
340. *Ecosystem Dynamics*. I. 3 hr. PR: Biol. 103 or equiv. Studies of modern approaches to ecosystem analysis. Emphasis will be on energy and material transfers. Approach will be holistic. (Course will not be offered in 1978-79.)
345. *Fisheries Science*. II. 4 hr. PR: Biol. 257 or consent. Population dynamics in relation to principles and techniques of fish management. (Offered in Spring of odd years.) (Course will not be offered in 1978-79.)
346. *Production Limnology*. II. 3 hr. PR: Biol. 103 or 246 or equiv. Production in freshwater ecosystems. Emphasis will be on methodology and results of research. Both primary and secondary production dynamics will be discussed. (Course will not be offered in 1978-79.)
350. *Biosystematics*. I. 3 hr. PR: Biol. 1 and 2 or equiv. Techniques, history, and principles of the systematics of plants and animals. (Offered in the Fall of odd years.) (Course will not be offered in 1978-79.)
351. *Plant Morphology (Algae and Fungi)*. II. 4 hr. PR: Biol. 1 and 2 or equiv. Development and structure of algae and fungi. (Offered in the Spring of even years.) (Course will not be offered in 1978-79.)
352. *Plant Morphology (Bryophytes and Vascular Plants)*. II. 4 hr. PR: Biol. 1 and 2 or equiv. Development and structure of bryophytes and vascular plants. (Offered in the Spring of odd years.) (Course will not be offered in 1978-79.)
354. *Fresh-Water Algae*. I. 4 hr. PR: Biol. 1 and 2 or equiv. Taxonomy, cytology, and ecology of aquatic, aerial, and land forms of fresh-water algae. (Offered in the Fall of even years.)
355. *Advanced Plant Systematics I*. II. 3 hr. PR: Biol. 151 or equiv. Taxonomy of pteridophytes, gymnosperms, and monocotyledons. (Offered in the Spring of odd years.) (Course will not be offered in 1978-79.)
356. *Advanced Plant Systematics II*. II. 3 hr. PR: Biol. 151 or equiv. Taxonomy of dicotyledons. (Offered in the Spring of even years.)
357. *Aquatic Seed Plants*. I. 3 hr. PR: Biol. 1 and 2 or equiv. Classification, ecology, and economic importance of aquatic seed plants.
358. *Field Studies of Invertebrates*. S. 3 hr. PR: Biol. 1 and 2 or equiv. Taxonomy and ecology of the invertebrates. (Course will not be offered in 1978-79.)
359. *Field Studies of Vertebrates*. S. 3 hr. PR: Biol. 1 and 2 or equiv. Taxonomy and ecology of the vertebrates. (Course will not be offered in 1978-79.)
362. *Developmental Biology*. I. 4 hr. PR: Biol. 101, 102, 262 or equiv. and organic chemistry. The molecular and cellular basis of differentiation and morphogenesis. (Offered in the Fall of even years.)

364. *Advanced Plant Physiology*. I, II. 3 hr. PR: Biol. 169 or equiv., organic chemistry, general physics, and consent. Advanced studies of plant processes including recent advances in the field. I. Spring semester, odd-numbered years — Water relations and mineral nutrition and translocation. II. Fall semester, odd-numbered years — Plant growth and development. III. Spring semester, even-numbered years — Environmental physiology. (*Course will not be offered in 1978-79.*)
365. *Environmental Physiology*. II. 4 hr. PR: Biol. 101 or consent. Physiological mechanisms by which organisms adapt to their environments, comparing adaptations of phyletically different organisms to similar environments and the adaptations of similar organisms to different environments. (*Course will not be offered in 1978-79.*)
443. *Advanced Plant Ecology*. II. 2-4 hr. PR: Biol. 103 and 243 or equiv. Advanced field studies in plant ecology. (*Offered in the Spring of even years.*)
497. *Research*. I, II, S. 1-15 hr.

CHEMISTRY

The Department of Chemistry offers graduate studies leading to the degrees of Master of Science and Doctor of Philosophy with research concentration in the areas of analytical, inorganic, organic, physical, and theoretical chemistry. The Master of Science and Doctor of Philosophy degrees require completion of a research project which represents the principal theme about which the graduate program is constructed.

Applicants for graduate studies in chemistry must have a bachelor's degree as a minimum requirement. Applicants for the M.S. program must have a major or concentration in chemistry and an appropriate background in physics and mathematics. All entering graduate students in chemistry are required to take Departmental Guidance Examinations in the major areas of chemistry. These examinations, on the undergraduate level, are administered before registration and serve to guide the faculty in recommending a course program for the beginning graduate student. Deficiencies revealed on the Guidance Examinations need to be corrected in a manner prescribed by the faculty.

The general Graduate School requirements for the Master of Science degree are outlined in the *Graduate School Catalog*. Graduate students in the M.S. program in chemistry are required to submit a research thesis. They may apply up to 6 hours of research credit toward the Graduate School 30-hour requirement. The remaining 24 hours of credit must be earned in the basic graduate courses which reflect a diversified exposure to chemistry; no more than 10 hours may be elected outside the department. A final oral examination is administered after completion and submission of the thesis.

The program for the degree of Doctor of Philosophy reflects a flexible, research-oriented approach geared to develop the interests, capability, and potential of mature students. A program of courses is recommended to suit individual needs based on background, ability, and maturity. These courses are classified as basic graduate courses which present the essentials of a given discipline on an advanced level, and specialized graduate courses which take one to the frontiers in a specific area of research. The course offerings are designed to provide guidelines from which students can launch their independent studies in preparation for candidacy examinations. Students are required to enroll in the departmental seminar program and are expected to attend special lectures and seminars offered by visiting chemists.

All graduate students in the Ph.D. program are expected to achieve a certain diversified background in the major areas of chemistry. In order to aid in this achievement, a departmental distribution requirement of one course in each of the four major areas of chemistry selected from the following course offerings must be met: Analytical 211, 315, 413, or 414; Inorganic 423, 424; Organic 331, 332, or 433; Physical 250, 341, or 443. In addition, each major area in chemistry requires students in the discipline to enroll in basic graduate courses which present the essentials of that discipline on an advanced level.

Candidacy examinations consist of both a written and oral portion. The written examinations are of the cumulative type, and are offered eight times a year. The oral examination is based on a proposition for a research problem not intimately related to the student's own problem, or any particular research problem being actively pursued at WVU. This proposition is presented in writing to the student's research committee and defended before that group and any other interested faculty members.

Each candidate for the Ph.D. must satisfy a departmental language requirement in a language approved by the student's research committee.

Research, which is the major theme of graduate studies, may be initiated as early as the student and faculty feel appropriate for each individual case. Normally, a student will begin laboratory work no later than the second semester. Upon successful completion of an original piece of research, the candidate will present results in a Ph.D. dissertation and at the appropriate time defend the work in a final oral examination.

Chemistry

Note: A charge is made for excessive breakage in laboratory courses and for failure to return desk equipment when leaving laboratory courses.

Chem.

201. *Chemical Literature*. II. 2 hr. PR: Chem. 131 or 134. Study of techniques of locating, utilizing, and presenting information needed by the research workers in chemistry. 2 hr. lect.
202. *Selected Topics*. I, II. 1-3 hr. PR: Written consent, with at least a 2.0 grade-point average in chemistry courses. Individual instruction under supervision of an instructor.
210. *Instrumental Analysis*. II. 3 hr. PR: Chem. 246. Basic instrumentation of analytical measurements. Electronics and instrument design. Methods of electrochemical and spectrochemical analysis. 2 hr. lect., 3 hr. lab.
211. *Intermediate Analytical Chemistry*. I. 3 hr. PR: Physical chemistry. Principles of analytical procedures and separations at an advanced level. 3 hr. lect.
222. *Chemistry of Inorganic Compounds*. II. 3 hr. PR: Physical chemistry. Correlation of reactions and properties of elements and compounds based on modern theories of chemical bonding and structure. Acid-base theory, non-aqueous solvents, ligand field theory, and stereochemistry. 3 hr. lect.
235. *Methods of Structure Determination*. I. 4 hr. PR: Chem. 134 and 136. Use of chemical methods and u.v., ir., n.m.r., e.s.r., Raman and mass spectroscopy to elucidate structures of organic compounds. For students in chemistry and related fields who may need these methods in research and applied science. 2 hr. lect., two 3-hr. lab.

237. *Polymer Chemistry*. I or II. 3 hr. PR: Chem. 135 and Physical chemistry. Methods, mechanisms, and underlying theory of polymerization. Structure and stereochemistry of polymers in relation to chemical, physical, and mechanical properties. 3 hr. lect.
239. *Organic Syntheses*. II. 2 hr. PR: Chem. 136. Modern synthetic methods of organic chemistry. Two 3-hr. lab.
241. *Crystallography*. I or II. 3 hr. PR or Conc.: Physical chemistry or consent. Applications of X-ray diffraction of crystals to the study of crystal and molecular structure. Includes theories of diffraction and crystallographic methods of analysis. 3 hr. lect. (*Course will not be offered in 1978-79.*)
243. *Introduction to Radiochemistry and Radiation Chemistry*. I. 3 hr. PR or Conc.: Physical chemistry. Fundamentals of radiochemistry and the use of tracer techniques. An introduction to radiation chemistry and how ionizing radiation interacts with matter. 2 hr. lect., 3 hr. lab. (*Course will not be offered in 1978-79.*)
244. *Colloid and Surface Chemistry*. II. 3 hr. PR: Physical chemistry. Selected topics in the properties and physical chemistry of systems involving macromolecules, lyophobic colloids, and surfaces. 3 hr. lect.
246. *Physical Chemistry*. I. 3 hr. PR: Chem. 18 or 115, Math. 16, and Physics 12. A first course in physical chemistry. Topics include a study of thermodynamics and chemical equilibria. 3 hr. lect.
247. *Physical Chemistry Laboratory*. I. 1-2 hr. PR or Conc.: Chem. 246. Experimentation illustrating the principles of physical chemistry and offering experience with chemical instrumentation. One 3-hr. lab.
248. *Physical Chemistry*. II. 3 hr. PR: Chem. 246 and Math. 17. Continuation of Chem. 246. Chemical dynamics and the structure of matter. 3 hr. lect.
249. *Physical Chemistry Laboratory*. II. 1-2 hr. PR: Chem. 246, 247, 248, or concurrent enrollment. Continuation of Chem. 247. Two 3-hr. lab.
250. *Chemical Bonding and Molecular Structure*. I. 3 hr. PR: Chem. 248. Introduction to the quantum theory of chemical bonding. Atomic structure, theoretical spectroscopy, predictions of molecular structures and bond properties. 3 hr. lect.
315. *Chemical Separations*. II. (Alternate Years.) 3 hr. PR: Chem. 115, 133, and Physical chemistry. Modern methods of chromatography from a theoretical and and practical standpoint. General principles of separation stressing the practical implementation of these principles with particular emphasis on high performance liquid chromatography and gas chromatography. 3 hr. lect. (*Course will not be offered in 1978-79.*)
331. *Advanced Organic Chemistry I*. I. 3 hr. PR: Chem. 134. Structural concepts, bonding, tautomerism, static and dynamic stereochemistry, mechanistic classifications of reagents, and reactions including some applications. 3 hr. lect.
332. *Advanced Organic Chemistry II*. II. 3 hr. PR: Chem. 331. Continuation of Chem. 331 with emphasis upon synthetic methods and reaction mechanisms. 3 hr. lect.
341. *Chemical Thermodynamics*. I or II. 3 hr. PR: Chem. 248. Principles of classical and statistical thermodynamics and their application to chemical problems. 3 hr. lect.
- 411, 412. *Seminar in Analytical Chemistry*. I, II. 1 hr. per sem. Current literature and research.

413. *Electrochemistry and Instrumentation*. I or II. 3 hr. PR: Chem. 210. Electronic instrumentation applied to study of mass transfer, kinetics of electrode reactions, voltammetry, and high-frequency methods. 3 hr. lect.
414. *Spectroscopic Methods*. I or II. 3 hr. PR: Chem. 210. Problems in design of instruments for each of the various spectral regions. 3 hr. lect.
- 417, 418. *Advanced Topics in Analytical Chemistry*. I, II. 1-3 hr. per sem. Recent advances and topics of current interest.
- 421, 422. *Seminar in Inorganic Chemistry*. I, II. 1 hr. per sem. Current literature and research.
423. *Advanced Inorganic Chemistry*. I or II. 3 hr. PR: Chem. 222. Bonding theories, stereochemistry, non-aqueous solvent systems, physical methods and current topics. 3 hr. lect.
424. *Coordination Chemistry*. I or II. 3 hr. PR: Chem. 222. Ligand field theory, spectral interpretations, stability considerations, synthetic methods, unusual oxidation states, organometallic compounds, other topics of current interest. 3 hr. lect.
425. *Inorganic Reactions and Mechanisms*. I or II. 2 hr. PR: Chem. 222 and 443. Substitution, isomerization, racemization, and oxidation-reduction reactions. 2 hr. lect. (*Course will not be offered in 1978-79.*)
- 427, 428. *Advanced Topics in Inorganic Chemistry*. I, II. 1-3 hr. per sem. Recent advances and topics of current interest.
- 431, 432. *Seminar in Organic Chemistry*. I, II. 1 hr. per sem. Current literature and research.
433. *Physical Organic Chemistry*. I or II. 3 hr. PR: Chem. 331. Theoretical considerations of organic molecules, kinetics and other methods used in the study of organic structure and reaction mechanisms, linear free energy relationship and other related topics. 3 hr. lect.
436. *Heterocyclic Chemistry*. I or II. 3 hr. PR: Chem. 331. Major heterocyclic systems and discussion of selected natural products containing heterocycles. 3 hr. lect. (*Course will not be offered in 1978-79.*)
- 437, 438. *Advanced Topics in Organic Chemistry*. I, II. 1-3 hr. per sem. Recent advances and topics of current interest.
- 441, 442. *Seminar in Physical Chemistry*. I, II. 1 hr. per sem. Current literature and research.
443. *Chemical Kinetics*. I or II. 3 hr. PR: Chem. 248. Theories and applications of kinetics in gaseous state and in solution. 3 hr. lect.
444. *Statistical Mechanics*. I or II. 3 hr. PR: Chem. 446. Theory and application of statistical mechanics to chemical systems. 3 hr. lect. (*Course will not be offered in 1978-79.*)
445. *Theoretical Chemistry I*. I or II. 3 hr. PR: Differential equations. Theoretical background for quantum mechanics. 3 hr. lect.
446. *Theoretical Chemistry II*. I or II. 3 hr. PR: Chem. 445. Theories and applications of quantum mechanics in chemistry. 3 hr. lect. (*Course will not be offered in 1978-79.*)

447. *Molecular Spectroscopy and Structure*. I or II. 3 hr. PR: Chem. 250. Advanced applications of spectral methods to a study of molecular structure. 3 hr. lect. (*Course will not be offered in 1978-79.*)
- 448, 449. *Advanced Topics in Physical Chemistry*. I, II. 1-3 hr. per sem. Recent advances and topics of current interest.
490. *Teaching Practicum*. I, II. 3 hr. PR: Consent. Supervised practices in college teaching of chemistry.
491. *Advanced Study*. I, II, S. 1-6 hr. PR: Consent. Investigation in advanced subjects which are not covered in regularly scheduled courses. Study may be independent or through specially scheduled lectures.
492. *Research Seminar*. I, II. 1 hr. PR: Graduate student in chemistry. Research seminars by visiting lecturers. (Graded as S/U.)
497. *Research*. I, II, S. 1-15 hr.
499. *Graduate Colloquium*. I, II, S. 1-6 hr. PR: Consent. For graduate students not seeking course work credit but who wish to meet residence requirements, use the University's facilities, and participate in its academic and cultural programs.

ENGLISH LANGUAGE AND LITERATURE

Master of Arts

Admission. To be admitted to the Department of English as a prospective candidate for the degree of Master of Arts, a student is expected to have completed work comparable to the department's undergraduate requirement for English majors and to present a record distinctly above the average.

The applicant may be admitted as a *Regular Graduate Student* — one who is approved for a degree program; as a *Regular With Deficiencies* — one who is approved but has deficiencies in his previous work to make up; as a *Special Graduate Student* — one who is not pursuing a degree program; or as *Special-Provisional* — one who because of an undergraduate record or late application cannot be immediately approved for a degree program.

Course Requirements. A candidate for the M.A. degree will be expected to complete courses covering the major periods and the works of the major authors of English and American literature. The minimum requirement is 30 hours of graduate work, 24 hours of which must be taken on the 300-400 course levels. A minimum of two 400-level seminars in literature is included in the 24-hour requirement.

Examinations. In addition to the final oral examination related particularly to the student's field of special interest as reflected in the master's thesis, a graduate student in English is required to take two 3-hour comprehensive written examinations in English and American literature. The student will normally take these examinations in the semester or term following that in which the student has established acceptable credit in 24 hours of graduate course work with an average of 3.0. The examinations will be conducted not later than four weeks before the last day of classes of a semester, or three weeks before the end of a summer term. With the permission of the Examining Committee, an unsuccessful candidate may be re-examined. Success in the examination admits the student to candidacy for a graduate degree.

Thesis. A student shall be required to write a thesis under the supervision of a thesis adviser. Information about the procedure of the dates for filing application for approval of projects, and about dates for submission of theses, is available at the office of the department. The thesis may be a work of scholarship, or criticism, or of creative writing (original poetry, drama, or fiction). Students may register for up to 12 hours of thesis credit, 6 of which can be included in the 30 hours required for the degree. Thesis hours will be graded as S (Satisfactory progress) or U (Unsatisfactory progress).

Foreign Language Requirement. A candidate for the degree of Master of Arts in English must have completed studies in a foreign language equivalent to 12 semester hours of college work. The applicant not having met this requirement may prepare to meet it through independent study, or otherwise, in order to show a reading knowledge on examination.

Doctor of Philosophy

Admission. An applicant for admission to the program will be judged on the basis of academic record, on three recommendations from former teachers, and on a personal, written statement outlining the applicant's academic and professional goals. The applicant may also submit, as an option, the results of the Graduate Record Examinations.

Provisional admission to the program may be granted to students whose credentials, while not exhibiting the high standards of prior academic achievement the department expects of doctoral candidates, promise excellence in the graduate study of English literature. Students admitted provisionally are expected to show high academic achievement during their first semester of doctoral study. All decisions on admission and status shall be made by the Graduate Admissions Committee.

Course Requirements. The doctoral program will normally require three years of full-time study beyond the master's degree or its equivalent. Thirty hours of credits in courses of the 300 and 400 series are normally required; however, exceptionally well-prepared students may be granted permission to take fewer than 30 hours of course work, upon recommendation of the Graduate Admissions Committee, in consultation with the Graduate Coordinator and the student's adviser. Of the normally required 30 hours, 12 must be taken in 400-level courses.

No credit will be given for courses in which the grade is C or less. A student who makes C or less in more than three courses will be dropped from the program.

The writing of the doctoral dissertation will carry a value of 12 additional hours.

Preliminary Qualifying Examinations. Sometime during the student's first two years of study in the doctoral program, in order to remain in the program, the student must pass a Preliminary Qualifying Examination, a 6-hour comprehensive written examination in English and American literature.

Examinations for Formal Admission to Candidacy. During the semester in which the student completes the course work, or soon thereafter, the student may qualify for formal admission to candidacy for the Ph.D. degree by successful completion of examinations in the fields of concentration chosen from the list in Group 1 (below). These examinations shall be:

1. two 3-hour written examinations drawn up from Group 1 by the adviser and the student's examination committee;

2. and one of the following options:
 - a. one 3-hour written examination drawn up from Group 2 by the adviser and examination committee.
 - b. one 3-hour written examination on a major author selected by the adviser and examination committee.

Fields of Concentration. For purposes of academic convenience, fields of concentration are listed as follows. Acceptance of a candidate for specialization in a given field will depend on the staff and other resources of the Department at the time of application.

Group 1 — Periods: a. Early and Middle English Language and Literature; b. The Renaissance; c. Restoration and Eighteenth-Century Literature; d. Romanticism; e. The Victorian Era; f. The Modern Period; g. American Literature.

Group 2 — Genres, Types, and Other Fields: a. Folklore and Folk Literature; b. English Linguistics and Philology; c. English Drama; d. Prose Fiction; e. Epic and Romance; f. Lyric Poetry; g. Non-fiction Prose; h. Literary Criticism.

Final Examination. When the dissertation has been accepted and approved by the candidate's adviser and the dissertation committee, the candidate will be given an oral examination by the committee. The examination will deal with the dissertation and the field it represents.

Teaching Requirement. After or during the completion of the course work, the doctoral student must teach successfully in the department for two semesters, one semester devoted to composition, the other to literature. Concurrent with the teaching practicum, the student must take one 400-level course in the teaching of composition and one 400-level course in the teaching of literature. This requirement will be optional for those candidates who possess teaching experience approved by the department. The student fulfilling this requirement will be designated a Teaching Fellow, an appointment equivalent to a "Part-time Instructorship" in the University.

Minor Subject. A student may complete all minor work in the Department of English, or may choose a minor, not to exceed 12 hours in 300- or 400-level courses, in a related subject offered by another department. Choice of the minor is subject to the approval of the Graduate Coordinator or a designate.

Foreign Language Requirement. The student must demonstrate proficiency in a foreign language acceptable to the Department of English. This requirement may be fulfilled either by passing a Graduate Reading Examination or by taking a minimum of two upper-division courses in the literature of the chosen language, which must be passed with a grade of A or B.

Doctoral Dissertation. After completing course work, passing the examinations for formal candidacy, and fulfilling the language requirement and teaching requirements, a student shall submit a prospectus of the dissertation, as specified by the Department, to the adviser. On approval of the prospectus by the student's dissertation committee, the student may apply for admission to candidacy for the Ph.D. degree.

The topic of the proposed dissertation should be such that a candidate can reasonably complete the project in one year of full-time work. It is the responsibility of the dissertation committee and adviser to see that the topic is sufficiently limited.

English

201. *Creative Writing Workshop: Fiction.* I, II. 3 hr. PR: English 101, 102, or equiv. or consent. Advanced workshop in creative writing for students seriously engaged in writing fiction.

202. *Creative Writing Workshop: Poetry*. I, II. 3 hr. PR: English 103, 104, or consent. Advanced workshop in creative writing for students seriously engaged in writing a major group of poems.
210. *Structure of the English Language*. I, II. 3 hr. Historical, comparative, and descriptive grammar, together with an introduction to English linguistics.
211. *History of the English Language*. I, II. 3 hr. Study of the nature of the language; questions of origins, language families, development, relationships of English as one of the Indo-European languages.
220. *American Poetry*. I, II. 3 hr. Study of major American poets of the nineteenth and twentieth centuries.
223. *Modern American Poetics*. I, II. 3 hr. A close study of those poets who have shaped the aesthetics of contemporary American poetry.
225. *Appalachian Experience in Literature*. I, II. 3 hr. An approach to understanding life through the imaginative literature of the region. Poetry, fiction, drama, cinema, and personal essays will be discussed.
232. *Literary Criticism*. I, II. 3 hr. History of literary criticism from Aristotle to modern times. (*Course will not be offered in 1978-79.*)
233. *Recent Literary Criticism*. I, II. 3 hr. Brief survey of theories of major schools of modern criticism and an application of these theories to selected literary works.
234. *Modern Drama*. I, II. 3 hr. World drama from Ibsen to the present day.
235. *American Drama*. I, II. 3 hr. Representative American Dramas and history of theatre in America.
236. *Tragedy*. I, II. 3 hr. Masterpieces of tragedy from Greek times to modern, with consideration of changing concepts of tragedy and of ethical and ideological values reflected in works of major tragic authors. (*Course will not be offered in 1978-79.*)
240. *Folk Literature*. I, II. 3 hr. The folk ballad, its origin, history, and literary significance, based on Child's collection and on American ballad collections.
241. *Folk Literature of the Southern Appalachian Region*. I, II. 3 hr. Traditional literature of southern Appalachian region, including songs, prose, tales, languages, customs, based on material collected in the region — especially in West Virginia. (*Course will not be offered in 1978-79.*)
250. *Shakespearean Comedies and History Plays*. I, II. 3 hr. Representative comedies and histories of Shakespeare, with the background of classical and Renaissance theory and practice.
251. *Shakespearean Tragedy*. I, II. 3 hr. Principal tragedies of Shakespeare, together with the history of criticism, scholarly investigation, and interpretation. (*Course will not be offered in 1978-79.*)
255. *Chaucer*. I, II. 3 hr. Early poems, *Troilus and Criseyde*, and *The Canterbury Tales*. In addition to an understanding and appreciation of Chaucer's works, the student is expected to acquire an adequate knowledge of Chaucer's language.
256. *Milton*. I, II. 3 hr. All of Milton's poems and a few selected prose works.
261. *Sixteenth Century Prose and Poetry*. I, II. 3 hr. Studies from Caxton to Bacon, from Skelton to Shakespeare.

262. *Seventeenth Century Prose and Poetry*. I, II. 3 hr. Studies from Donne to Dryden.
263. *Literature of the Eighteenth Century*. I, II. 3 hr. Literature of the period 1660-1744 in relation to social, political, and religious movements of the time.
264. *Literature of the Eighteenth Century*. I, II. 3 hr. Continuation of English 263, covering the latter half of the century. May be taken independently of English 263.
265. *The Romantic Movement*. I, II. 3 hr. A survey of the works of the major British Romantic writers along with an introduction to works of scholarship in British Romanticism.
266. *American Romanticism*. I, II. 3 hr. Writings of Ralph Waldo Emerson, Henry David Thoreau, and Nathaniel Hawthorne. A study of relations of these men to history of their own time; their contributions to American thought and art.
267. *Victorian Poetry*. I, II. 3 hr. The major Victorian poets — Tennyson, Browning, Arnold, Rossetti, Morris, Swinburne, Fitzgerald — and a few of the later Victorian poets. (*Course will not be offered in 1978-79.*)
268. *Modern British Poetry*. I, II. 3 hr. British poetry from 1880 to present, including the Decadents, Counter-Decadents, Hopkins, Housman, Hardy, the Georgians, the Imagists, World War I poets, Yeats, Eliot, the Auden Group, and post-World War II poets. (*Course will not be offered in 1978-79.*)
280. *Southern Writers*. I, II. 3 hr. Examination of twentieth-century Southern essayists, poets, short-story writers, and novelists in relation to ideological background.
283. *Study of Selected Authors*. I, II. 3 hr. Study of the works of one or more major authors.
286. *Black American Fiction*. I, II. 3 hr. Survey of novels and short stories written by black Americans from 1890 to the present.
288. *Women Writers in England and America*. I, II. 3 hr. Syllabus may vary from year to year to include women writers in a particular country, historical period, or genre; or writing on a particular theme.
290. *Independent Study*. I, II. 1-3 hr. PR: Departmental consent. With departmental consent, may be repeated for a maximum of 9 credit hours. Individual study of literary, linguistic, and writing problems.
291. *Special Topics*. I, II. 3 hr. PR: Departmental consent. With departmental consent, may be repeated for a maximum of nine credit hours. (Credit received for repeating English 291 only when content of course is different.) Topics in literature, language, or writing.
310. *Old English I*. I, II. 3 hr. Study of Anglo-Saxon with selected readings from the literature of the period.
311. *Old English II*. I, II. 3 hr. PR: English 310. *Beowulf* and other texts in Old English. (*Course will not be offered in 1978-79.*)
330. *Early English Drama*. I, II. 3 hr. Study of the medieval and early Tudor drama to the age of Shakespeare. (*Course will not be offered in 1978-79.*)
331. *Elizabethan Drama*. I, II. 3 hr. Study of dramas of Shakespeare's contemporaries and successors to the closing of the theatres in 1642. Includes Kyd, Marlowe, Jonson, Heywood, Chapman, Webster, Beaumont, and Fletcher.

332. *Restoration and Eighteenth Century Drama*. I, II. 3 hr. Comedy, tragedy, the heroic play, the drama of sensibility and the reaction against it: Etherege, Wycherley, Farquhar, Congreve, Vanbrugh, Dryden, Otway, Goldsmith, and Sheridan.
334. *Contemporary Drama*. I, II. 3 hr. Recent developments in the drama, with special attention to Miller, Williams, Sartre, Anouilh, Osborne, Pinter, Bolt, and the Absurdist. Content altered as new playwrights representing new developments come into prominence.
335. *The English Novel to the Time of Scott*. I, II. 3 hr. Study of the English novel from the sixteenth century to the time of Scott, showing the development of the novelistic art from early narrative beginnings. (*Course will not be offered in 1978-79.*)
336. *The English Novel, 1832-1900*. I, II. 3 hr. Continuation of English 335. Development of the English novel from the early nineteenth century to the beginning of the twentieth century.
337. *The Modern Novel*. I, II. 3 hr. Twentieth-century novel, with emphasis on works of selected British novelists.
340. *The American Novel to 1915, I*. I, II. 3 hr. History of American novel, based on reading of ten or twelve novels, from the beginning to World War I.
341. *The American Novel, II*. I, II. 3 hr. History of the American novel, based on readings of ten to twelve novels from World War I to the present.
350. *Shakespeare*. I, II. 3 hr. Intensive study of selected plays. Special attention to textual problems and to language and poetic imagery, together with the history of Shakespearean criticism and scholarship.
356. *Romantic Poetry*. I, II. 3 hr. Reading and study of the works of selected poets of the British Romantic movement with emphasis on related criticism and scholarship.
365. *Victorian Prose*. I, II. 3 hr. Study of the non-fictional writings of the great Victorian prose critics: Carlyle, Ruskin, Arnold, Newman, Macaulay, Huxley, and Morris.
366. *English Literature, 1880-1918*. I, II. 3 hr. Study of the more important writers and literary movements of the late Victorian and the Edwardian periods; emphasis on Hardy, Housman, Hopkins, Henley, Pater, Gissing, Moore, Butler, and writers of the "Aesthetic Movement." (*Course will not be offered in 1978-79.*)
369. *American Literature to 1830*. I, II. 3 hr. The major genres and themes of American literature in the colonial and early national periods (1620-1830) with special attention to the cultural context of the literature. (*Course will not be offered in 1978-79.*)
370. *American Literature, 1830-65*. I, II. 3 hr. Study of the literature of the Romantic period in American literature, concentrating on Emerson, Thoreau, Poe, Hawthorne, and Melville.
371. *American Literature, 1865-1915*. I, II. 3 hr. Study of the literature of transcendentalism, realism, and naturalism in America between the Civil War and World War I, concentrating on Whitman, Twain, James, Dickinson, Crane, Adams, and Dreiser.
372. *American Literature, 1915-Present*. I, II. 3 hr. A study of American prose, poetry, and drama since 1915.
391. *Approaches to Teaching Composition*. S. 3 hr. Surveys attitudes toward and techniques of teaching writing in elementary and secondary schools. Provides frequent

opportunities for students to write, to analyze their writing, and to experiment in class with various methods of teaching writing to children and young adults. Special attention to formulating writing assignments and to devising effective methods of evaluation and grading. (Not for credit in the Ph.D. program.)

400. *Thesis*. I, II. 3 hr.
401. *Thesis*. I, II. 3 hr.
440. *Medieval Literature*. I, II. 3 hr. Topics from English literature, 1100-1500, exclusive of Chaucer and the drama.
441. *Medieval Literature*. I, II. 3 hr. Chaucer's early poems, *Troilus and Criseyde*, and *The Canterbury Tales*.
446. *Renaissance Literature*. I, II. 3 hr. Studies devoted to a major non-dramatic writer of the period.
447. *Renaissance Literature*. I, II. 3 hr. Studies devoted to a major topic of the period.
450. *English Drama to 1642*. I, II. 3 hr.
456. *Folklore and Folk Literature. Seminar*. I, II. 3 hr. Research projects in folklore, including field work in collecting folklore in the Appalachian region and the analysis of the use of folklore in the works of British and American authors.
460. *Seminar in Eighteenth Century Studies*. I, II. 3 hr.
470. *Romanticism*. I, II. 3 hr. Studies in major authors and special topics in the field of English Romanticism.
476. *Seminar in Victorian Studies*. I, II. 3 hr. Research and discussion in selected topics in the literature and history of the period.
484. *Seminar*. I, II. 3 hr. Seminar in principal authors and movements in American literature from Colonial Period to 1870.
- 486, 487. *American Literature, 1870-*. I, II. 3 hr. per sem. Literary and intellectual America from 1870 to 1914 in terms of leading literary men and changing cultural patterns of the period. Discussion and analysis of selected prose and poetic works.
490. *Teaching Practicum*. I, II. 3-6 hr. I. Supervised practices in college teaching of expository writing. II. Supervised practices in college teaching of literature.
491. *Advanced Study*. I, II. 3 hr. Specific topics approved by the instructor.
492. *Introduction to Literary Research*. I, II. 3 hr. Bibliography; materials and tools of literary investigations; methods of research in various fields of literary history and interpretation; problem of editing. Practical guidance in the writing of theses.
494. *Seminar*. I, II. 3 hr. Specific authors to be approved by instructor.
496. *Seminar*. I, II. 1 hr. PR: Departmental consent. Research paper to be presented orally to the faculty and students of the Department of English.
497. *Research*. I, II. 1-15 hr. PR: Departmental consent.
498. *Doctoral Thesis*. I, II. 1-6 hr. PR: Departmental consent.
499. *Graduate Colloquium*. I, II. 1-6 hr. PR: Departmental consent.

FOREIGN LANGUAGES

The Department of Foreign Languages offers graduate study in French, German, Greek, Latin, Russian, and Spanish literature and culture, in linguistics, in language teaching methods, and in bibliography and research. Candidates for the master's degree are accepted in any of the above areas as long as they fulfill all requirements of the M.A. listed below.

A student who wishes to do graduate work in the department should apply to the chairman, who will serve as temporary adviser until an advisory committee is appointed to direct the student's work. The committee will be formed toward the end of the first semester or the beginning of the student's second semester of study. The student will be expected to have an undergraduate major in the foreign language of interest or be required to make up certain deficiencies. The student should normally show an average of at least 3.0 (B) in undergraduate foreign language courses.

Requirements

1. Thirty-six hours of graduate work for the Master's exclusive of 490 (Teaching Practicum) and 499 (Graduate Colloquium). Thesis may count for 9 hours of this requirement.

2. Minimum of four courses in literature.

3. Minimum of one course in linguistics.

4. Minimum of one course in culture.

5. Reading knowledge of two foreign languages or achievement of 50th percentile or better on MLA teacher examinations in one language. Master's candidate must take all four language skills examinations and achieve 50th percentile on each if only one language is presented.

6. Demonstration of ability to undertake research and to write clearly and succinctly. Student is to demonstrate this ability by one of the following:

a. A or B in Bibliography and Methods 365

b. Presentation of acceptable Master's thesis

c. Publication of one or more acceptable research articles

d. Acceptance of two research papers of B quality or better as judged by three members of the department. Members of the committee to be determined by the department chairman. If only one vote is negative, a fourth member will be asked to read the paper.

7. Seven-hour written examination based upon the reading list. Student will have a reading list composed of seven sections. Six sections will be selected from the master reading list. The seventh section may be drawn up by the student and the student's major adviser or selected from the master reading list. Candidates who write a thesis will have the number of sections (and hours of the examination) reduced by three.

8. Two-hour oral examination based upon course work.

All graduate assistants are required to complete Language Teaching Methods 421 as part of the work in the major fields unless they have had a similar course in their undergraduate study. The candidate's committee, together with the student, will determine the distribution of courses and the thesis requirement in the light of the student's aims and needs. The committee also will administer written and oral comprehensive examinations near the end of the candidate's course of study. Both oral and written examinations are normally given only twice a year, in November and in April.

Graduate assistants are required to enroll each semester in L.T.M. 490 and L.T.M. 499, although these credits do not count toward the master's. They are also expected to attend the Speech Communication workshop and to enroll in Speech Communication 496.

Special Summer Courses of Study Abroad

These courses are currently offered in Spanish, French, and German, and are listed in the WVU *Summer Session Schedule of Courses*, but they usually begin early, before the end of May, and end around the first of July. Spanish courses are held in Colombia or Madrid, Spain; French courses are conducted at Deauville in France; in Germany classes are held in St. Goarshausen. Students normally register for two courses at WVU, but all work is carried on overseas.

Bibliography and Research

365. *Methods of Research*. I. 3 hr.

Classics

201. *Roman Novelists*. I. 3 hr. PR: Classics 109, 110, or equiv. (*Course will not be offered in 1978-79.*)
202. *Romance Comedy*. II. 3 hr. PR: Classics 109, 110, or equiv. (*Course will not be offered in 1978-79.*)
235. *Roman Epic*. I. 3 hr. PR: Classics 109, 110, or equiv.
292. *Pro-Seminar in Latin or Greek Literature*. 1-6 hr. Special topics.
392. *Seminar in Latin or Greek Literature*. 1-6 hr. Special topics.
497. *Research*. 1-15 hr.

Foreign Literature in Translation

FLIT

292. *Pro-Seminar*. I, II, S. 1-6 hr.* PR: 6 hr. of upper-division literature courses or consent. Special topics.
392. *Seminar*. I, II, S. 1-6 hr.* PR: 6 hr. of upper-division literature courses or consent. Special topics.

French

203. *Conversational French*. I. 3 hr. PR: French 110 or consent. Intensive spoken French. (*Course will not be offered in 1978-79.*)
217. *French Civilization*. II. 3 hr. PR: 12 hr. of French.
221. *The Romantic Movement*. I. 3 hr. Consent.

*Variable credit courses normally carry 3 hr. credit. Exceptions are made only in emergencies and must be approved by the department chairman and the professor teaching the course.

- 222. *French Realism*. II. 3 hr. Consent.
- 229. *Literature of the Sixteenth Century*. I. 3 hr. Consent.
- 231. *Phonetics and Pronunciation*. II. 3 hr. PR: 18 hr. of French or equiv.
- 292. *Pro-Seminar*. I, II, S. 1-6 hr.* Special topics.
- 305. *Fundamentals for Reading French*. I. 3 hr. PR: Graduate or upper-division standing. French 305-306 is intended for graduate students from other departments to teach them to read general and technical French.
- 306. *Reading French*. II. 3 hr. PR: 12 hr. of French or equiv. or French 305. Graduate students may meet a doctoral foreign language requirement by achieving a grade of B or better in this course.
- 326. *Literary Criticism*. II. 3 hr. PR: A.B. in French or consent.
- 337. *Moliere*. II. 3 hr. PR: A.B. in French or consent. (*Course will not be offered in 1978-79.*)
- 344. *Explication de Textes*. II. 3 hr. PR: 18 hr. of French or equiv.
- 371. *The Modern Novel to 1930*. I. 3 hr. PR: A.B. in French or consent.
- 372. *The Novel After 1930*. II. 3 hr. PR: A.B. in French or consent.
- 381. *Medieval French Literature*. II. 3 hr. PR: Linguistics 342.
- 392. *Seminar*. 1-6 hr.* Special topics.
- 497. *Research*. 1-15 hr.

German

- 242. *Faust*. II. 3 hr. PR: German 4 or consent. Critical study of Goethe's *Faust*.
- 243. *Medieval German Literature*. I. 3 hr. PR: German 4 or consent.
- 245. *Classicism and Romanticism*. I. 3 hr. PR: German 4 or consent. Critical study of German literature from 1750 to 1830.
- 246. *The Liberal Age*. II. 3 hr. PR: German 4 or consent. Critical study of German literature from 1830 to 1880.
- 247. *The Age of Crisis*. I. 3 hr. PR: German 4 or consent. A critical study of German literature from 1880 to present.
- 265. *German Civilization*. I. 3 hr. PR: 12 hr. of German or consent. A general comprehensive survey of the most important aspects of German culture, including a brief historical background, the development of the German language, geography, science, music, art, architecture, literature, and philosophy.
- 292. *Pro-Seminar*. 1-6 hr.* Special topics.

*Variable credit courses normally carry 3 hr. credit. Exceptions are made only in emergencies and must be approved by the department chairman and the professor teaching the course.

301. *Independent Reading*. I. 3 hr. Supervised reading for students who wish to do intensive work in any field of interest.
302. *Independent Reading*. II. 3 hr. Continuation of German 301.
305. *Fundamentals for Reading German*. I. 3 hr. PR: Graduate or upper-division standing. German 305-306 is intended for graduate students from other departments to teach them to read general and technical German.
306. *Reading German*. II. 3 hr. PR: 12 hr. of German or equiv. or German 305. Graduate students may meet a doctoral foreign language requirement by achieving a grade of B or better in this course.
361. *Lyric Poetry*. I. 3 hr. PR: 18 hr. of German or consent.
375. *The Modern Novel*. I. 3 hr. PR: 18 hr. of German. Supervised reading of nineteenth century novels. (*Course will not be offered in 1978-79.*)
376. *The Modern Novel*. II. 3 hr. Continuation of German 375, with emphasis on recent fiction.
392. *Seminar*. 1-6 hr.* Special topics.
497. *Research*. 1-15 hr.

Language Teaching Methods

LTM

221. *The Teaching of Foreign Languages*. I. 3 hr. Required of all students who are prospective foreign language teachers on the secondary level.
292. *Pro-Seminar*. 1-6 hr.* Special topics.
392. *Seminar*. 1-6 hr.* Special topics.
421. *Teaching Foreign Language in College*. I, II. 1-6 hr.* Methods and techniques of teaching a foreign language at the college level.
490. *Teaching Practicum*. I, II, S. 1-3 hr.
497. *Research*. 1-15 hr.*
499. *Graduate Colloquium*. I, II, S. 1-6 hr.* Required each semester of all graduate assistants in Department of Foreign Languages.

Linguistics

Ling.

202. *Phonology*. I. 3 hr. PR: Ling. 1, 111 or consent. Description of sounds and sound systems in language. Articulatory phonetics. Structuralist and generative approaches to phonetics.

*Variable credit courses normally carry 3 hr. credit. Exceptions are made only in emergencies and must be approved by the department chairman and the professor teaching the course.

203. *Morphology and Syntax*. II. 3 hr. PR: Ling. 111 or consent. Grammatical analysis with emphasis on morphological and immediate constituent analysis.
211. *History of the Spanish Language*. II. 3 hr. PR: Consent. Evolution of Castilian from Vulgar Latin to its modern standard form through a study of historical phonology, morphology, and syntax together with the external factors which influenced the development of the language. (*Course will not be offered in 1978-79.*)
217. *Structure of Spanish*. I. 3 hr. PR: Ling. 111 or consent. Description of the phonological or grammatical systems of Spanish, with emphasis on contrastive analysis (Spanish English) and applied linguistics.
241. *History of the French Language*. II. 3 hr. PR: Consent. Evolution of French from Vulgar Latin into the Modern French standard through a study of historical phonology, morphology, and syntax together with the external factors which influenced the development of the language.
247. *Structure of Modern French*. I. 3 hr. PR: 18 hr. of French and Ling. 111 or consent. Study of phonology, morphology, and syntax of modern French together with a contrastive analysis of French and English.
251. *History of the German Language*. I. 3 hr. PR: 18 hr. of German or consent. Historical development of standard German with emphasis on its relationships to the other German languages and dialects.
257. *Structure of German*. II. 3 hr. PR: 18 hr. of German and Ling. 111 or consent. Phonological, morphological, and syntactical structure of contemporary German language.
261. *History of the Russian Language*. I. 3 hr. PR: 18 hr. of Russian and Ling. 111 or consent. Development of Russian from Indo-European to the present.
267. *Structure of Russian*. II. 3 hr. PR: 18 hr. of Russian and Ling. 111 or consent. Phonological, morphological, and syntactical structure of contemporary Russian.
283. *Transformational Grammar*. S. 3 hr. PR: Ling. 111 and consent. Emphasis on generative syntax in English, German, Romance, and Slavic languages.
284. *History of Linguistics*. I. 3 hr. Development of linguistics from Greeks and Romans to contemporary researchers with concentration on major linguists and schools of the nineteenth and twentieth centuries.
287. *Psycholinguistics*. I. 3 hr. PR: Ling. 111 or consent. Provides an insight into the many areas of psycholinguistic study, including language acquisition, sentence processing, animal communication, dichotic listening, aphasia, and semantics. (*Course will not be offered in 1978-79.*)
288. *Dialectology*. I. 3 hr. PR: Ling. 1, 111 or consent. Introduction to linguistic study of geographical and social variation in language.
292. *Pro-Seminar*. 1-6 hr.* Special topics.
313. *Old Spanish*. II. 3 hr. PR: Consent.

*Variable credit courses normally carry 3 hr. credit. Exceptions are made only in emergencies and must be approved by the department chairman and the professor teaching the course.

343. *Old French*. I. 3 hr. PR: Consent. Study of the oldest monuments of the French language including the *Chanson de Roland* and *Aucassin et Nicolette* in an effort to trace the evolution of Francien, Anglo-Norman, and Picard and Vulgar Latin. (*Course will not be offered in 1978-79.*)
353. *Middle High German I*. I. 3 hr. PR: 18 hr. of German and Ling. 111 or consent. Study of the linguistic developments of Middle High German from the eleventh to the fifteenth centuries with illustrative reading from the *Nibelungenlied*.
354. *Middle High German II*. II. 3 hr. PR: Ling. 353. Continuation of Ling. 353 with illustrative readings from the Middle High German lyric poets and the courtly epics.
392. *Seminar*. 1-6 hr.* Special topics.
497. *Research*. 1-15 hr.*

Russian

292. *Special Topics*. 1-6 hr. PR: Russian 4 or equiv.
305. *Fundamentals for Reading Russian*. I. 3 hr. PR: Graduate or upper-division standing. Russian 305-306 is intended for graduate students from other departments to teach them to read general and technical Russian.
306. *Reading Russian*. II. 3 hr. PR: 12 hr. of Russian or equiv. or Russian 305. Graduate students may meet a doctoral foreign language requirement by achieving a grade of B or better in this course.

Spanish

221. *Literature of the Golden Age to 1635*. I. 3 hr. PR: 18 hr. of Spanish or equiv.
222. *The Golden Age After Lope De Vega*. II. 3 hr. PR: 18 hr. of Spanish or equiv.
223. *Estudios De Estilo*. I. 3 hr. PR: 18 hr. of Spanish or equiv. (*Course will not be offered in 1978-79.*)
292. *Pro-Seminar*. 1-6 hr.* Special topics.
315. *Lyric Poetry*. I. 3 hr. PR: 12 hr. of Spanish or equiv.
324. *Explicacion De Textos*. II. 3 hr. PR: 18 hr. of Spanish or equiv.
325. *The Picaresque Novel*. I. 3 hr. PR: 18 hr. of Spanish or equiv.
391. *Cervantes*. II. 3 hr. PR: 18 hr. of Spanish or consent. (*Course will not be offered in 1978-79.*)
392. *Seminar*. 1-6 hr.* Special topics.
395. *Sixteenth Century Literature*. I. 3 hr. PR: 18 hr. of Spanish or consent.
497. *Research*. 1-15 hr.*

*Variable credit courses normally carry 3 hr. credit. Exceptions are made only in emergencies and must be approved by the department chairman and the professor teaching the course.

GEOLOGY AND GEOGRAPHY

The Department of Geology and Geography offers work leading to the degrees of Master of Science and Doctor of Philosophy in Geology.

Applicants for graduate studies in geology must have as a minimum requirement a bachelor's degree. Acceptances by the Graduate School and also by the Department of Geology and Geography are necessary before admission of any prospective student to the program. All candidates for a graduate degree in geology must submit scores in the general aptitude test of the Graduate Record Examination.

During the first week of classes each student must take a comprehensive entrance examination. The student must pass the examination or enroll in courses designed to improve the student's understanding of basic concepts.

Students seeking admission to the Master's program for Option One, Two, or Four, or to the Ph.D. program, must complete the equivalents of all science and mathematics courses required for the B.S. degree in geology at WVU before being admitted to these programs.

In the descriptions that follow, "formal course" means a cataloged lecture or seminar course and "Problem" means a directed, but independent exercise in the solution of a specific problem and the presentation of results.

Master of Science

No later than the beginning of the second semester in residence, the prospective candidate must choose one of four options leading to the Master of Science degree in geology. A minimum grade-point average of 3.0 (B) for all courses must be maintained by M.S. students.

Option One: Master of Science in Geology (M.S.)—Research

This has been the "traditional" option for the Master of Science in geology. Students considering continued studies (Doctor of Philosophy degree) should choose this option.

A minimum of 24 formal-course credits and 6 research credits are required for graduation. A thesis based on original research also is required. With consent of the candidate's advisory committee, the field work need not be done while in residence at WVU.

Required to Graduate: 30 credits; work in three or more emphasis areas; satisfactory completion of comprehensive examination.

Option Two: Master of Science in Geology (M.S.)—Professional Studies

This option is designed specifically for students seeking experience in preparing and presenting professional problems. Students choosing this option would be seeking employment in technical fields rather than continuing studies for a higher degree.

A minimum of 34 formal-course credits and 8 Problems credits are required for graduation. The additional course work in lieu of a thesis is designed to simulate the work of professional geologists as they seek solutions to open-ended problems. Experience in presentation of problems and solutions is an integral part of the program.

Problems credits may be earned in conjunction with off-campus experiences by consent of the candidate's advisory committee.

Required to Graduate: 42 credits; work in three or more emphasis areas; satisfactory completion of comprehensive examination.

Option Three: Master of Science in Geology (M.S.)—Geographic Studies

A bachelor's degree is required of students entering this multidisciplinary field. Approval of the department is required for admission to option three.

The objective of this program is to train persons for positions in government, education, and industry that deal with management of the environment. Programs will be designed to fit the particular goals of individual students with emphasis on study of the man-land relationships of the environment.

A minimum of 30 formal-course hours and 10 Problems credits are required. At least 9 course hours in geology exclusive of remedial courses are required.

Required to Graduate: 40 hours work in two or more emphasis areas. Satisfactory completion of comprehensive examination.

Option Four: Master of Science in Geology (M.S.)—Earth Science Education

Students entering this option must have a bachelor's degree. The Earth Science Education student recognizes the need for multidisciplinary studies in planning earth science programs in secondary schools. A candidate in this option will receive a broad background in the philosophy and practice of investigating the earth and in understanding and interpreting for others the results of such investigations.

The candidate and the advisory committee will design a curriculum based on requirements for Earth Science Certification in other states. The state of West Virginia does not grant Earth Science Education certification.

Course work in two or more related fields (e.g. biology, chemistry, geography, physics, agronomy) is required. A minimum of 30 formal-course hours and 10 Problems credits are required.

Required to Graduate: 40 hours; work in four or more emphasis areas.

Emphasis Areas in Department of Geology and Geography

I. Quantitative Methods and Techniques: Stat. 311, Stat. 312, Geol. 396, 399, Geog. 261, (and other disciplines).

II. Geomorphology and Hydrogeology: 221, 222, 228, 363, 395, (and other disciplines).

III. Sedimentation, Stratigraphy, Low Temperature Geochemistry and Sedimentary Petrology: 261, 340, 341, 344, 346, 362, 385, 394.

IV. Paleobiology: 231, 235, 336, 432, (and selected biology courses).

V. Economic Geology, Coal Geology, Petroleum Geology: 270, 272, 294, 371, 372, 374, 394.

VI. Igneous and Metamorphic Geology, High Temperature Geochemistry: 385, 386, 394.

VII. Structural Geology, Geophysics: 251, 351, 357.

VIII. Environmental Studies: Geog. 202, 209, 210, 219, 220, 225, 230, 261; Geol. 221, 222, 228, 363, 395.

The designation of specific Geol. 290 and 420 courses and Geog. 219 will be made by the instructor.

Doctor of Philosophy

The candidate for the Ph.D. must complete a program of courses outlined by the candidate's doctoral committee with a grade-point average of at least 3.3 in all courses taken each semester. Reading competence in a foreign language is required and comprehensive examinations must be successfully completed. Work on original research is to be presented in a dissertation and defended in an oral examination.

Research

Close cooperation between the West Virginia Geological and Economic Survey, located in Morgantown, and the Department of Geology and Geography makes a large amount of material available for laboratory investigation. This includes the fossil collections of the department and the survey. A large number of samples of drill cuttings from deep wells in West Virginia and adjoining states are housed in the survey. The department also has a number of cooperative projects with the U.S. Energy Research and Development Administration, Morgantown Center. Morgantown is conveniently situated for detailed studies of Mississippian, Pennsylvanian, and Permian formations. Mineral products of the region near Morgantown include coal, petroleum, natural gas, and limestone. The occurrence and utilization of these materials can be studied by graduate students interested in economic geology. A permanent summer field camp (Camp Wood) is located in the Folded Appalachians at Alvon, Greenbrier County. The coastal geology program includes an annual trip to the Florida Keys, and three weeks on the shore of Virginia. Additional oceanography courses and research are available at the Marine Science Consortium at Wallops Island, Virginia, with which WVU is affiliated.

Geology

Geol.

201. *Physical Geology for Teachers*. I, II, S. 3 hr. PR: High school teaching certificate and consent. Composition and structure of earth and the geologic processes which shape its surface. Credit cannot be obtained for both Geol. 201 and Geol. 1 or 5. (*Course will not be offered in 1978-79.*)
202. *Physical Geology Laboratory for Teachers*. I, II, S. 1 hr. Accompanies Geol. 201. Laboratory and field study of earth materials and features, and the topographic and geologic maps used to represent them. (*Course will not be offered in 1978-79.*)
221. *Geomorphology*. I. 3 hr. PR: Geol. 1 or 5. An examination of the physical processes which shape the surface of the earth, with emphasis on fluvial processes and environmental geomorphology. Optional field trip at student's expense.
222. *Glacial Geology*. II. 3 hr. PR: Geol. 1 or 5. Introduction to glaciology and glacial geology, with emphasis on topographic form and the nature of glacial deposits. The Quaternary history of North America is stressed. Optional field trip(s) at student's expense.
228. *Photogeology*. II. 3 hr. PR: Geol. 127, 151, or consent. Instruction in basic and advanced techniques of air photo interpretation.

231. *Invertebrate Paleontology*. I. 4 hr. PR: Geol. 3, 4, or consent. Invertebrate fossils: biologic classification, evolutionary development, ecology, and use in correlation of strata.
235. *Introductory Paleobotany*. I, II. 4 hr. PR: Geol. 3. Resume of development of principal plant groups through the ages, present distribution, mode of occurrence and index species, methods of collection. Required Saturday field trips at student's expense.
251. *Advanced Topics in Structural Geology*. II. 2-4 hr. PR: Geol. 151, or consent; Undergraduates need consent. Oral and written presentations by students and instructor on selected topics in descriptive, regional, experimental, and theoretical structural geology. (*Offered in Spring of odd-numbered years.*)
261. *Stratigraphy and Sedimentation*. II. 3 hr. PR: Geol. 1 or consent. Study of sediments and sedimentary rocks. Field techniques stressed as data gathered and interpreted from rocks of Pennsylvanian age in Morgantown vicinity. Two-day field trip required. Basic field equipment and field trips at student's expense.
266. *Appalachian Geology Field Camp*. S. 6 hr. PR: Geol. 151, 261. Practical experience in detailed geological field procedures and mapping. Living expense in addition to tuition must be paid at time of registration.
270. *Mineral Resources*. I. 3 hr. PR: Geol. 1, 184. Description, mode of occurrence, and principles governing the formation of ore deposits. (*Course will not be offered in 1978-79.*)
272. *Petroleum Geology*. II. 1-4 hr. PR: Geol. 151. Origin, geologic distribution, methods of exploration and exploitation, uses and future reserves of petroleum and natural gas in the world.
274. *Coal Geology*. I. 3 hr. PR: Geol. 151, or consent. Introduction to origin, composition, geologic distribution, and exploration of coals.
290. *Geologic Problems*. I, II, S. 1-6 hr. (12 hr. max.). Special problems for seniors and graduates. Also includes field trips such as Florida Bay carbonate trip.
294. *Introduction to Geochemistry*. II. 4 hr. PR: Chem. 16. Basic review of physical and aqueous chemistry, discussion of the basic geochemical processes; calcium carbonate chemistry, diagenetic processes, weathering, the silicate and iron systems.
315. *Environmental Geoscience*. I. 3 hr. PR: Geol. 1 or consent for non-geology majors. Principles, practice and case histories in application of earth science to environmental problems. Includes: water quality; landslides, subsidence; waste disposal; legal aspects; geologic aspects of land-use planning. Field trips and independent field project required.
340. *Advanced Stratigraphy*. II. 4 hr. PR: Geol. 231. Study of principles of rock and time correlation, and their application to the stratigraphy of West Virginia. Emphasis on carbonate rocks.
341. *Carbonate Sedimentology*. II. 4 hr. PR: Geol. 231 or equiv. Origin and distribution of modern marine carbonate sediments as models for interpretation of ancient limestone and dolomite facies complexes. Laboratory experience in thin section petrography of skeletal and non-skeletal carbonate grains, and rock compositions and fabrics.

344. *Clay Geology*. I, II. 2-3 hr. PR: Geol. 185, 261, 369. Study of clay mineralogy with secondary emphasis on the origin and deposit of clay minerals in the stratigraphic record.
346. *Advanced Sedimentation*. I. 4 hr. PR: Geol. 185. Origin of sedimentary rocks; principles involved in interpretation of ancient geography, climates, animals, and plants. Emphasis on detrital sediments and rocks. Required field trips at student's expense.
351. *Tectonics*. II. 3 hr. PR: Geol. 151 or consent. Theories of large deformational processes operating within the earth's crust and upper mantle. Study of the regional structural geology of selected orogens. (*Offered in Spring of even years.*) (*Course will not be offered in 1978-79.*)
353. *Geophysics*. I. (Alternate Years.) 4 hr. PR: Geol. 151, 261 or equiv. Geologic interpretation of geophysical data with emphasis placed on structural and stratigraphic interpretation of seismic records in explorations for hydrocarbon deposits.
357. *Basin Structures*. I. (Alternate Years.) 4 hr. PR: Geol. 151, 261, or equiv. The origin, development, and distribution of basins and the structure found within basins throughout the world are studied. The distribution of energy-related minerals related to basins and structural accumulations are emphasized.
362. *Sedimentology Field Camp*. S. 3-6 hr. PR: Geol. 261 or equiv. Field-lab course in experimental, modern, and ancient sedimentation. Living expenses in addition to tuition must be paid at time of registration. Field expenses extra. (*Course will not be offered in 1978-79.*)
363. *Ground-water Hydrology*. I. 3 hr. PR: Geol. 1 or consent. Study of the principles of ground-water hydrology; occurrence, development, uses, and conservation of ground-water.
364. *Advanced Ground-water Hydrology*. II. 3 hr. PR: Geol. 1, 2, 363 or consent. Review of ground-water exploration, flow, and quality in various geologic terrains. Ground-water pollution and other environmental effects are covered, along with well pumping tests and modeling of ground-water flow.
376. *Coal Petrology*. II. 3 hr. PR: Geol. 274 or consent. Microscopic examination and determination of optical properties of coals, environment of deposition, diagenesis, and metamorphism of coals; coal chemistry and petrography.
385. *Optical Mineralogy*. I. 4 hr. PR: Geol. 185 and one year of physics; Undergraduates need consent. Principles and practice in use of the petrographic microscope in identification of minerals by the immersion method and thin section. Sedimentary petrology with emphasis on clastics and diagenesis.
386. *Petrology*. II. 4 hr. PR: Geol. 385. Composition, texture, occurrence, and origin of rocks. Study of hand specimens and thin sections. (*Course will not be offered in 1978-79.*)
394. *Physical Geochemistry*. I. 3 hr. PR: Geol. 1, 184, 185, Chem. 16. Phase diagrams, metamorphic facies, origin of the elements, chemical properties of ions, crystal chemistry of minerals, element distributions and geochemical cycles.
395. *Aqueous Geochemistry*. I, II. 3 hr. PR: Geol. 1, Chem. 16 or consent. Review of basic chemical principles as they apply to aqueous geologic environments. Properties of water and the types, sources, and controls of the common and environmentally significant chemical species dissolved in water.

399. *Quantitative Methods in Geo-Sciences*. II. 4 hr. PR: Stat. 311, or 311A and B and E, or consent. Brief review and introduction to specific quantitative techniques as applied to geology and geography.
420. *Advanced Topics*. I, II. 1-12 hr. Includes separate courses in geophysics, karst, advanced hydrology, instrumentation, paleoecology, regional geology, environmental geoscience, paleobiogeography, advanced coal petrology, and advanced paleontology.
432. *Micropaleontology*. I. 4 hr. PR: Geol. 231. Identification of Foraminifera, Ostracoda, and conodonts; emphasis on classification, nomenclature, and use of paleontological literature. (*Course will not be offered in 1978-79.*)
492. *Non-Thesis Research*. I, II, S. 1-12 hr. PR: Consent. Supervised non-thesis research for M.S. Options II, III, and IV. Report required by arranged deadline.
497. *Research*. I, II. 1-15 hr.

Geography

Geogr.

202. *Political Geography*. II. 3 hr. Examines the interrelationship between politics and the environment, human territoriality, the political organization of space, geopolitical aspects of the nation-state and international problems.
209. *Industrial Location*. II. 3 hr. PR: Geogr. 109 or consent. Applied theoretical aspects of location decisions in primary, secondary, and tertiary activities. Emphasis will be on the understanding of location patterns and the impact of industries on other characteristics of communities.
210. *Urban Geography*. I. 3 hr. An introduction to the geography of the city incorporating consideration of urban systems and city-region linkages, patterns and processes of urban land use, the social geography of the city, and contemporary urban problems.
215. *Population Geography*. II. (Alternate Years.) 3 hr. Study of the geographic distribution of population and population characteristics including density, age, fertility, morality and settlement patterns. Problems of migration and population/resource issues also will be covered, with an emphasis on developing countries.
219. *Problems in Geography*. I, II. 1-9 hr. PR: Consent. Planning internship, or independent research.
220. *Seminar in Geography*. I, II. 1-9 hr. per sem.; Max. 15 hr. PR: Consent. Includes separate seminars in urban, economic, physical, medical, behavioral, social, Appalachian, transportation, environmental, education, census, planning, resource, agricultural, international studies, geographic model building, rural problems, recreation, and cartography.
225. *Urban Planning Concepts and Techniques*. II. 3 hr. PR: Geogr. 210 or Pol. Sci. 121 or consent. Explores concepts, techniques, and processes of physical and social planning and their application to urban problems including: land use allocation, location of economic activity, housing, transportation, and the delivery of services.
230. *Human Settlement Design and Process*. I. 3 hr. Analysis of spatial organization of settlements from an ecological perspective. Models of settlement form, function, and process are developed, and issues of efficiency and community design are examined using examples from different cultures. (*Offered alternate years.*)

235. *The Experience of Space*. II. 3 hr. Explores the individual's changing experience of geographical space over the life cycle as reflected in activity patterns, territoriality, and environmental images. Traces environmental design implications for settings including schools, nursing homes, parks, and shopping malls. (*Course will not be offered in 1978-79.*)
261. *Cartography*. II. 3 hr. An introduction to map appreciation and the theory and practice of map design.
285. *Methods of Geographic Research*. I or S. 1-6 hr. PR: Consent. Practical experiences in field mapping, field interviewing, library research, spatial sampling, data analysis, and report preparation and presentation.
491. *Advanced Study in Geography*. I, II, S. 1-6 hr. Investigation of topics not covered in regularly scheduled courses. Study may be independent or through scheduled meetings.
496. *Graduate Seminar in Geography*. I, II, S. 1-6 hr. Regularly scheduled meetings for discussion of literature and research design related to particular topics in geography.
497. *Research in Geography*. I, II, S. 1-6 hr.

HISTORY

Master of Arts

Candidates for admission to the master's degree program in history should have had 18 hours of upper-division undergraduate work in history and 9 hours of upper-division undergraduate work in some closely related subject, preferably economics, political science, or sociology and anthropology. A reading knowledge of one foreign language is desirable. Candidates should have a minimum 2.5 overall average in the undergraduate program and a minimum 3.0 overall average in their majors or minors in history.

The Department of History requires that all candidates for the Master of Arts degree in history present an overall average of 3.0 (B) for all graduate courses taken; it will not accept toward an advanced degree credits in courses offered by the Department of History which are reported with a grade lower than B.

There are two routes to the master of arts degree in history: a 36-hour degree and a 30-hour degree. The 36-hour degree includes a minimum of 24 semester hours in history, 6 of which shall consist of courses of the 300-400 seminar series. It is possible to include in the 36-hour program a minimum of 9 to 12 hours in one minor representing a closely related discipline in the College of Arts and Sciences. It also is possible that all 36 hours be in the Department of History. The candidate for the 36-hour master's will be required to pass a final oral comprehensive examination covering the candidate's graduate course work.

The 30-hour degree consists of 24 hours of course work in history and incorporates a thesis for which 6 hours credit may be allowed. The candidate for the 30-hour master's will be required to pass a final oral comprehensive examination covering the graduate course work and the thesis.

Doctor of Philosophy

Requirements for the Ph.D. degree in history include the general requirements of the Graduate School; a reading knowledge of two foreign languages approved by

the Department; passing the Ph.D. comprehensive examination of two parts (oral and written) administered by a committee of faculty members (normally at the end of a full-time student's second year of study); preparation of an acceptable dissertation based upon original investigation; and successful defense of the dissertation in a final examination.

A candidate must offer a program of study in four fields, at least three of which must be in history; the other may be in a related field approved by the department. The Department of History requires that all candidates for the doctor's degree present an overall average of 3.0 (B) for all graduate courses taken; it will not accept toward an advanced degree credits in courses offered by the Department of History which are reported with a grade lower than B. Students shall offer four sub-fields, at least two of which must be in one general field:

1. European Medieval; Early Modern (1400-1789); Recent (1789-present).
2. American to 1865; Since 1850.
3. English 1066-1660; 1660-Present.
4. Third World Africa; Asia; Latin America.
5. Field in Another Department.

Selection of a field of concentration does not necessarily mean a selection of the dissertation field.

Program in the History of Science and Technology

The College of Arts and Sciences and the Department of History recently inaugurated a program in the history of science and technology. Graduate research assistantships have been established for students affiliated with the program and graduate-level instruction is available. Further information is available at the Department of History office.

History

Hist.

200. *Greece and Rome*. 3 hr. Covers the Minoan and Mycenaean civilizations, Archaic and Classical Greece, Alexander the Great and the Hellenistic Age, the Roman Republic, the Etruscan and Carthaginian states, and the rise of the Roman Empire.
201. *Social and Economic History of the Middle Ages, 300-1000*. 3 hr. Topics include the social-economic crisis of the late Roman and German institutions, the Merovigian and Caroligian economics, Pirenne Thesis, and transition to feudal society. Hist. 103 recommended as preparation. (*Course will not be offered in 1978-79.*)
202. *Social and Economic History of the Middle Ages, 1000-1500*. 3 hr. Topics include feudal society, land and population expansion, fairs, towns, leagues, Italian leadership, crusades, church influence, black death, fourteenth century revolts, and general decline of late Middle Ages. Hist. 103, 201 recommended as preparation. (*Course will not be offered in 1978-79.*)
205. *The Renaissance*. 3 hr. Survey of the underlying political, economic, and social structure of fourteenth and fifteenth century Italy with concentration on the significant intellectual and cultural trends which characterized the age. Some consideration given to the problem of the impact of the early Reformation movement upon Renaissance culture.
206. *The Reformation*. 3 hr. The distinguishing theological characteristics of the major Reformation movements with concentration on the effect of religious-intellectual crisis on the political and social structure of the sixteenth century.

207. *Early European Science and Culture*. 3 hr. Examination of European intellectual history from the Renaissance to the early eighteenth century with particular attention being paid to contribution of Copernicus, Bacon, Descartes, Kepler, Galileo, and Newton.
208. *Science and Society, 1750-1914*. 3 hr. Historical examination of the relationship between science and technology with particular attention being paid to the doctrines of Positivism, Darwinism, and Scientific Socialism.
209. *The ABC Powers of Latin America*. 3 hr. Detailed course of the political events and of the economic and cultural institutions of Argentina, Brazil, and Chile from the dawn of independence to the present day.
210. *Modern Spain*. 3 hr. Survey of Spanish political, economic, and cultural developments from national unification under Ferdinand and Isabella to Francisco Franco. Includes Portuguese history from 1580 to 1640.
213. *Bourbon France*. 3 hr. French history from the reign of Henry IV to the reign of Louis XVI. Special attention given to the reigns of Louis XIII and Louis XIV. Political, cultural, and intellectual history emphasized.
214. *The Revolutionary-Napoleonic Era*. 3 hr. French history from mid-eighteenth century to 1815. Special attention given to the background of the French Revolution of 1789, to the political and social history of the revolution, and to Napoleon's nonmilitary achievements.
215. *European Diplomatic History, 1815 to 1919*. 3 hr. Designed to develop an understanding of the forces, men, and events which determined diplomatic relations between the major powers. (*Course will not be offered in 1978-79.*)
216. *European Diplomatic History, 1919 to Present*. 3 hr. Scope similar to that of Hist. 215. (*Course will not be offered in 1978-79.*)
217. *Diplomatic History of the U.S.S.R., 1917 to 1939*. 3 hr. Detailed study of Soviet diplomatic history, with emphasis on the view from the Kremlin balanced by the responses of other powers. Understanding of European diplomatic history desirable.
218. *Diplomatic History of the U.S.S.R., 1939 to Present*. 3 hr. Scope similar to that of Hist. 217.
222. *Twentieth-Century Germany from Weimar to Bonn*. 3 hr. The Weimar Republic, the Third Reich, and the two German states created after World War II.
225. *History of Modern China*. 3 hr. Introduction to modern China (since 1839) with some attention to China's Confucian heritage; examines in detail the Chinese effort to modernize in the face of Western diplomatic and economic pressure; specific attention to China's Nationalist and Communist revolutionary traditions.
226. *History of Modern Japan*. 3 hr. Introduction to modern Japan (since 1868) with some attention to the development of Japanese institutions and ideas in earlier periods, especially the Tokugawa Era (1600-1868); examines the rapid pace of economic change in the nineteenth and twentieth centuries along with the important social, political, and diplomatic implications of this change.
227. *East Africa to 1895*. 3 hr. History of East Africa from earliest man to beginning of European control. Population movement and interaction, development of varying types of polity, revolutionary changes, and European scramble for East Africa form major focus.

228. *East Africa Since 1895*. 3 hr. History of colonial rule and movement to independence in East Africa. Political, economic, and social changes will be examined with particular emphasis on rise and triumph of African nationalism.
229. *History of Africa: Pre-Colonial*. 3 hr. History of Africa from earliest man to the middle of the nineteenth century. Particular emphasis on population movement and interaction, state formation, and the development of trade in sub-saharan Africa as well as the impact of such external influences as Christianity and Islam. (*Course will not be offered in 1978-79.*)
230. *History of Africa: European Dominance to Independence*. 3 hr. History of Africa from the middle of the nineteenth century to the 1960's. In the first half of the course, the establishment and functioning of European colonial regimes in African history, and recent interpretations in the field. (*Course will not be offered in 1978-79.*)
231. *Seventeenth Century Britain, 1603-1715*. 3 hr. The more significant political, social, economic, religious, and intellectual developments of Britain during a century of revolution and of the men and women who interacted with those movements.
232. *Eighteenth Century Britain, 1715-1832*. 3 hr. The "Age of Aristocracy," the political, social, religious, economic, and intellectual forces which produced it, and the reasons for its decline under the combined impact of the Industrial, Agricultural, American, and French revolutions.
241. *English Social History, Fourteenth to Eighteenth Century*. 3 hr. Topical examination of English society from the time of Chaucer to Milton. Major topics: society in town and country, economy, politics, religion, and thought.
242. *English Social History, Eighteenth Century to the Present*. 3 hr. Topical examination of English society from the time of Queen Anne to the present.
251. *History of Black People in America to 1900*. 3 hr. Consideration given to slave trade and evolution of slavery in the New World, the attack upon slavery and its destruction, the South and the Negro during Reconstruction, and the age of Reaction and Racism, 1875-1900.
252. *History of Black People in America Since 1900*. 3 hr. Consideration given to race conflict and black migration, the blacks in American world wars, desegregation practices both in the South and the North, and trends toward black nationalism.
253. *Civil War and Reconstruction*. 3 hr. Study of the causes as well as the constitutional and diplomatic aspects of the Civil War; the role of the American Negro in slavery, in war, and in freedom; and the economic and political aspects of Congressional Reconstruction.
255. *The Cleveland Era*. 3 hr. The "Gilded Age," with emphasis on the political and social impacts of urban-industrial growth. Growth of large cities and a national communications network, the rise of the corporation, the subordination of regional interests and racial minorities, political protest movements and changes in the structure and sociology of politics, with special attention to the Congress and the Presidency. (*Course will not be offered in 1978-79.*)
257. *The United States From McKinley to the New Deal, 1896 to 1933*. 3 hr. American national history from William McKinley to Franklin D. Roosevelt. Particular attention given to the great changes in American life after 1896; national political, economic, social, and cultural development; the Progressive Era in American politics; and alterations in American foreign relations resulting from the Spanish-American War and World War I. (*Course will not be offered in 1978-79.*)

259. *Recent American History, 1933 to Present*. 3 hr. Detailed study of American national history from the inauguration of Franklin D. Roosevelt to the present. Emphasis on the New Deal; on Roosevelt's foreign policies and their impact on American social, technological, and cultural developments; and on United States domestic problems and foreign relations since 1945. (*Course will not be offered in 1978-79.*)
261. *Economic and Social Development of West Virginia*. 3 hr. Study, primarily regional in nature, of the economic, social, technological, cultural, and religious history of West Virginia.
263. *American Diplomacy to 1918*. 3 hr. American foreign policy and diplomacy from the adoption of the Constitution to the end of World War I. Assumes some student knowledge of the period such as that obtained in Hist. 52 and 53.
264. *American Foreign Policy and Diplomacy, 1918 to the Present*. 3 hr. America's foreign policy and growing involvement in international relations including our role in World War II, the Korean War, and Vietnam. Assumes that the student has some knowledge of the period such as that obtained in Hist. 3, 53, or 161.
266. *American Economic History to 1865*. 3 hr. Origins and development of American business, agricultural, and labor institutions, problems, and policies, from 1600 to 1865; influence of economic factors upon American history during this period.
267. *American Economic History Since 1865*. 3 hr. Covers 1865 to the present. Scope similar to that stated for Hist. 266.
268. *The Old South*. 3 hr. History of the South — exploring the peculiar differences that led to an attempt to establish a separate nation. The geographical limitation permits a detailed study of economic and social forces within the context of the larger national history. (For advanced undergraduates and graduates.)
269. *The New South*. 3 hr. Integration of the South into the nation after Civil War. Emphasis on southern attitudes toward industrialization, commercial agriculture, organized labor, and the Negro. Special attention to the southern literary renaissance and conservative and progressive politics of the southern people.
271. *The American Frontier East of the Mississippi*. 3 hr. Westward expansion from discovery of America to Louisiana Purchase. Emphasis on frontier section in the region from the Tidewater to the Mississippi Valley. (*Course will not be offered in 1978-79.*)
272. *The American Frontier West of the Mississippi*. 3 hr. Westward expansion from the Louisiana Purchase to the passing of the frontier in 1893. Original investigation and reassessment of a number of controversial problems. (*Course will not be offered in 1978-79.*)
273. *The City in American History*. I. 3 hr. The Era of Commerce, 1630-1895: concerning the settlement, design, and growth of North American commercial and administrative centers particularly transportation development and the role of urban elites in shaping national economic policies. (*Course will not be offered in 1978-79.*)
274. *The City in American History*. II. 3 hr. The Industrial Age, 1820-present: focusing on the interaction of industrialization and urbanization during the nineteenth and twentieth centuries particularly the impact of technology upon urban life and the role of cities in national politics. (*Course will not be offered in 1978-79.*)
301. *Readings in Medieval History*. 3-6 hr. Crusades and intellectual history are the focus. Readings in preparation for medieval field may be selected by graduates. Hist. 103 urged strongly for undergraduates; also reading knowledge of Latin, French or German recommended for all.

305. *Readings in English History.* 3-6 hr. Directed readings of scholarly books and articles, primarily in the history of England from about 1450 to about 1625 but with some opportunity for the student to fill gaps in his knowledge of other periods of English history.
309. *Readings in Central European History.* 3-6 hr. All students will read and discuss selected works illustrating outstanding scholarship or interpretative problems related to fifteenth, sixteenth, and early seventeenth century history. In addition opportunity will be provided for each student to pursue an independent reading project tailored to his special interests.
313. *Readings in Eastern European History.* 3-6 hr. For the student who desires to read on a specific topic in Russia or Soviet history. Materials selected will be primarily in the most scholarly studies available in English. (*Course will not be offered in 1978-79.*)
317. *Readings in Western European History.* 3-6 hr. This course, primarily for graduate students and selected undergraduates, is designed for an intensive reading program on special problems in western European history.
321. *Readings in Asian History.* 3-6 hr. Intensive readings in the history of East Asia (especially China and Japan) since the nineteenth century; students should normally have had Hist. 225 and 226 or their equivalents; reviews as well as bibliographical and historiographical essays required. (*Course will not be offered in 1978-79.*)
325. *Readings in African History.* 3-6 hr. This course will normally focus on readings and discussion on problems in the history of pre-colonial Africa, the major works in African history, and recent interpretations in the field. (*Course will not be offered in 1978-79.*)
351. *Readings in American History, 1492-1789.* 3-6 hr. A course of supervised readings and reports designed to prepare students for intensive study in a seminar or for field examinations in the colonial period of American history. Students are expected to acquire comprehensive and detailed bibliographical knowledge. (*Course will not be offered in 1978-79.*)
355. *Readings in American History, 1763-1865.* 3-6 hr. A course of supervised reading and reports designed to prepare students for intensive study in a seminar or for field examinations in the early national period. Students are expected to acquire comprehensive and detailed bibliographical knowledge.
359. *Readings in American History, 1850-1898.* 3-6 hr. A survey of the narrative and interpretative literature of the Civil War, Reconstruction, and the Gilded Age. Students will be expected to make weekly or bi-weekly reports on assigned readings and also to prepare a critical essay on some aspect of American historiography for this period.
363. *Readings in American History, 1898 to Present.* 3-6 hr. Reading and class-led discussion of one paper-back book per week, and preparation of a paper based on these books and the class discussion of them. Usually concentrates on post World War II foreign relations.
367. *Readings in Frontier History.* 3-6 hr. A detailed course of reading of sources and significant secondary works in frontier literature. (*Course will not be offered in 1978-79.*)
373. *Readings in Local and Regional History.* 3-6 hr. A course for graduate students and seniors in the history of West Virginia and neighboring states, which form what is known as the Trans-Allegheny or Upper Ohio region.

375. *Readings in Science and Technology*. 3-6 hr. Directed reading of scholarly books and articles dealing with selected topics in the history of science and technology.
377. *European Cultural and Intellectual History. (300-1000 A.D.)* 3 hr. Topical approach including the development of early Christian thought, the conflict of pagan and Christian thought, the Latin Church Fathers, Boethius, Irish & Anglo-Saxon culture, the Carolingian Renaissance. Hist. 103 recommended, as well as reading knowledge of Latin, French, or German.
378. *European Cultural and Intellectual History. (1000-1500)*. 3 hr. Topics include Cathedral Schools, Renaissance of 12th century, Arab influence on Western thought, Scholasticism, post-Thomistic reaction, and developing political theory. Hist. 103, 301 plus reading knowledge of Latin, French, German or Italian are all recommended.
381. *Intellectual and Social History of the United States to 1876*. 3 hr. The objective of the course is to establish for graduate students usable frames of reference for intellectual and social history. The basic premises of various historians are examined as they have been applied to the history of the United States before 1876. (*Course will not be offered in 1978-79.*)
382. *Intellectual and Social History of the United States Since 1876*. 3 hr. A continuation of Hist. 381, with the same objective of establishing usable frames of reference for intellectual and social history, with the focus on the history of the United States since 1876. Special attention is devoted to the problems of very recent or contemporary history. (*Course will not be offered in 1978-79.*)
391. *The American Labor Movement*. 3 hr. A readings course which emphasizes the various labor unions and labor's political activities in the United States from the eighteenth century to 1960. Careful attention is given to the economic and social conditions that have shaped the history of labor in this country. The course treats the story of American labor as an integral part of the history of the United States.
392. *History of American Agriculture*. 3 hr. A readings course to acquaint students with the origins and evolution of American agriculture, with particular emphasis upon scientific, technological, and economic development; to familiarize them with some public and private agricultural organizations; and to give them a historical understanding of contemporary agricultural problems and policies.
402. *Seminar in Medieval History*. 3 hr. Crusades and intellectual history of Europe in the Middle Ages with emphasis on the period from 1000 to 1300. Prerequisites: History 301 and reading knowledge of Latin plus French or German or Italian.
406. *Seminar in English History*. 3 hr. Directed research in selected topics in the history of England from about 1450 to about 1625. Training in bibliography, research methods, and paleography.
410. *Seminar in Central European History*. 3 hr. An intensive survey of the bibliographical aids and printed source materials available in the field of Reformation history. A research paper and a bibliographical essay will be presented by each student. Reading knowledge of German and French strongly recommended. (*Course will not be offered in 1978-79.*)
414. *Seminar in Eastern European History*. 3 hr. Selected topics in nineteenth or twentieth century Russian/Soviet diplomatic or political history. Research paper required.
418. *Seminar in Western European History*. 3 hr. A research seminar in selected topics in western European history. Requirements: examinations, problem papers, research

papers, and extensive reading. A reading knowledge of the appropriate languages also is required. (*Course will not be offered in 1978-79.*)

422. *Seminar in Asian History*. 3 hr. Advanced readings and research in East Asian history; specific emphasis on research tools and techniques; research paper based on English-language sources required; students should normally have had Hist. 225 and 226 or their equivalents. (*Course will not be offered in 1978-79.*)
426. *Seminar in African History*. 3 hr. The seminar will normally focus on Eastern Africa in the colonial period. Location and use of source materials will be emphasized as well as economic and political developments. Students will spend considerable time in research and writing on selected aspects of Eastern African history. (*Course will not be offered in 1978-79.*)
452. *Seminar in American History, 1492-1789*. 3 hr. Students work together and with the instructor on the historical materials of the era, confronting the problems and learning the techniques for using different kinds of original materials. Periodic progress reports are required at each meeting and one major paper, derived primarily from the original materials being used. (*Course will not be offered in 1978-79.*)
456. *Seminar in American History, 1763-1865*. 3 hr. Students work together and with the instructor on historical materials of the era, confronting the problems and learning the techniques for using different kinds of original materials. Periodic progress reports required at each meeting and one major paper, derived primarily from the original materials being used. (*Courses will not be offered in 1978-79.*)
460. *Seminar in American History, 1850-1898*. 3 hr. Directed research in recent American history including guidance in method of research and manuscript preparation. (*Course will not be offered in 1978-79.*)
464. *Seminar in American History, 1898 to Present*. 3 hr. Directed research in recent American history including guidance in method of research and manuscript preparation.
468. *Seminar in Frontier History*. 3 hr. Intensive study of selected frontier problems. Requirements: detailed outside reading and a term paper on some original topic based on sources and secondary works. (*Course will not be offered in 1978-79.*)
474. *Seminar in Local and Regional History*. 3 hr. A seminar for graduate students in the history of West Virginia and neighboring states, which form what is known as the Trans-Allegheny or Upper Ohio region. (*Course will not be offered in 1978-79.*)
477. *American Historiography*. 3 hr. A review of the major American historians and biographers and their interpretative studies. The nationalism, imperial, frontier, sectional, social and intellectual schools of history are studied as well as those historians who have concerned themselves with the problems of writing history.
478. *European Historiography*. 3 hr. Readings of selected works representative of each of the following historical periods: Ancient, Medieval, Renaissance-Reformation, Early Modern, and Modern. Reports required with attention to style, purpose, philosophy, and methodology of the historians selected. Attention to trends, major breakthroughs, and classics in the writing of European history. Reading knowledge of Greek, Latin, French, German, or Italian an asset.
- 481, 482. *Special Problems*. 1-3 hr. ea.
490. *Teaching Practicum*. 1-3 hr. PR: Consent. Supervised practices in college teaching of history. (*Note: This course is intended to insure that graduate assistants are*

adequately prepared and supervised when they are given college teaching responsibility.) (Graded as S/U.)

497. *Research*. 1-15 hr.

LIBRARY SCIENCE

The Department of Library Science offers courses for those students who are enrolled in the College of Human Resources and the Graduate School for an M.A. Degree in Elementary or Secondary Education.

The courses are designed for:

1. Elementary or secondary school teachers who wish to meet the certification requirements for school library media specialists in West Virginia and other states.
2. School librarians who plan to develop professionally.
3. Teachers and school librarians in need of in-service training.
4. Administrators who wish to broaden their knowledge and training in the field of school library media.
5. As an elective in other Graduate programs.

Library Science

Lib. Sci.

- 201.* *Reference and Bibliography*. I, S. 3 hr. PR: Consent. Basic reference books, dictionaries, encyclopedias, indexes, yearbooks, and other reference materials are studied and evaluated, with emphasis on the theory of and practical experience with reference books for print and non-print materials.
- 203.* *Literature for Children*. I, II, S. 3 hr. Survey of children's literature including historical development, and emphasizing current trends. Consideration of the criteria for and means of evaluating print and non-print materials for support of the curriculum, recreation, and child guidance.
- 205.* *Selection of Books and Related Materials for the Secondary School Library*. I, II, S. 3 hr. Survey of adolescent literature and other library materials adapted to the needs of junior and high school students.
- 207.* *Organization and Administration of the Instructional Materials Center in the Secondary School*. I, S. 3 hr. PR: Lib. Sci. 205, 223, for school librarians. Study of organization and administration, including planning, equipment, routines, and schedules, and the role of the librarian in the instructional program.
- 222.* *Field Practice*. I, II, S. 3 hr. PR: Lib. Sci. 201, 203, 205, 207, 223, or 235. Practical experience in a variety of public, school, and special libraries, and instructional materials centers, under the supervision of experienced librarians and media specialists. Student must complete 100 clock hours.
- 223.* *Cataloging and Classification*. II, S. 3 hr. Basic principles and problems of cataloging and classification combined with practical experience in processing the various types of books and materials. Problems peculiar to the teacher-librarian considered.
224. *History of Books and Libraries*. I, S. 3 hr. Survey course, including the development of the book from early manuscript form, history of printing, printers, book illustration, bindings, and the library and its development. (*Course will not be offered in 1978-79.*)

*Presently required for Certification in West Virginia.

- 235.* *Organization and Administration of the Instructional Materials Center in the Elementary School*. II, S. 3 hr. PR: Lib. Sci. 223. For school librarians. Includes planning quarters; selection, acquisition, and organization of books and other materials; supervision of library assistants; and relations with faculty, administration, and community.
326. *Literature of the Social Sciences*. I, S. 3 hr. PR: Consent. Bibliographic and reference sources in the social sciences. Course designed to give the student a good working knowledge of the major sources of information in the social sciences and the ability to make effective use of the library. (*Course will not be offered in 1978-79.*)
330. *Library Resources for the School Curriculum*. II, S. 3 hr. Library and community resources, print and non-print, for curriculum enrichment. Presented to elementary and secondary teachers and to librarians to help them give more effective services. (*Course will not be offered in 1978-79.*)
410. *Special Topics*. 3 hr. A thorough study of some phase of library science based on the needs and interest of the individual. (*Course will not be offered in 1978-79.*)
411. *Problem Report*. 3 hr. PR: 9 hr. of Education courses. (*Course will not be offered in 1978-79.*)

MATHEMATICS

The Department of Mathematics offers the Master of Science degree. Under this degree, programs are designed to provide graduate education for students desiring to study pure mathematics, for students who wish to do interdisciplinary work (in preparation for work in industry and elsewhere), and for students who are or intend to be teachers of mathematics.

Entering students should have the equivalent of the mathematics requirements for an undergraduate major at WVU. Students who desire a preparatory program for teaching at the secondary level should have completed the courses required for a teaching field in mathematics. Deficiencies may be remedied by the completion of recommended undergraduate courses or by examination. Such remedial work cannot be used to meet the degree requirements.

Each student, upon beginning a graduate program, will be assigned an Advisory Committee. The Committee will assist the student in designing the plan of study which takes into account the student's interest and objectives. The program will usually include 30-33 hours of graduate courses. A thesis may account for at most 6 hours of the total. A final examination (comprehensive in nature) or project is required for the degree.

Students are expected to maintain at least a 3.0 (B) average in their mathematics courses and to present at least a 3.0 average in all work offered in fulfillment of the degree program.

For a more complete statement of requirements, the student is referred to the Department's handbook for *Graduate Students in Mathematics*.

Mathematics

Math.

213. *Partial Differential Equations*. II. 3 hr. PR: Math. 113 or consent. Introduces students in mathematics, engineering, and the sciences to methods of applied mathematics. First and second order equations, canonical forms, wave, heat and La-Place's equations, representation of solutions. (*Course will not be offered in 1978-79.*)

214. *Vector Analysis*. I, II. 3 hr. PR: Math. 18. Primarily for engineers and scientists. Vector algebra, differential operators, curvilinear coordinate systems, Stokes' and Gauss' theorems, applications, linear systems of equations, matrices, determinants, quadratic forms, eigenvalues and canonical forms, and numerical inversions. (*Course will not be offered in 1978-79.*)
215. *Applied Modern Algebra*. II. 3 hr. PR: Consent. Introduction to graph theory. Boolean algebras, monoids, finite-state and Turing machines with applications to computer design, algebraic coding theory and computer language, especially ALGOL. (*Course will not be offered in 1978-79.*)
217. *Applied Mathematical Analysis*. II. 3 hr. PR: Math. 18 or 51. The algebra and differential calculus of vectors, solution of the partial differential equations of mathematical physics, application of functions of a complex variable.
219. *Seminar in Applied Mathematics*. I, II. 1-12 hr.
226. *Mathematical Statistics*. II. 3 hr. PR: Math. 16 or consent. Designed for mathematics teachers. Frequency distributions, averages, probability, populations, samples, probability distributions, estimations, hypothesis testing. Although no previous knowledge of computer language is assumed, the computer will be used in this course.
- 231, 232. *Introduction to Mathematics for the Elementary Teacher*. I, II. 3 hr. per sem. PR: Math. 34 or consent. (Not open to students who have credit for Math. 131, 132.) For inservice elementary mathematics teachers. Systems of numeration; sets, relations, binary operations, the algebraic structure of various number systems; the notions of length, area, and volume; coordinate geometry.
239. *Elementary Number Theory*. II, S. 3 hr. PR: Math. 16 or Math. 131 or consent. A study of divisibility, congruences, linear and quadratic diophantine equations, number theoretic functions, and applications of number theory to other areas of mathematics. (*Course will not be offered in 1978-79.*)
241. *Introduction to Linear Algebra*. I, II. 3 hr. PR: Math. 163 or consent. A study of vector spaces, subspaces, quotient spaces, direct sums, linear transformations, fundamental isomorphism theorems, matrix representations, dual spaces, canonical forms. Multilinear algebra (i.e., bi-linear functions, determinants.).
- 251, 252. *Introduction to Real Analysis*. I, II. 3 hr. per sem. PR: Math. 163 or consent. A study of sequences, convergence, limits, continuity, definite integral, the derivative, differentials, functional dependence, multiple integrals, sequences and series of functions.
255. *Advanced Real Calculus*. S. 3 hr. PR: Math. 51 or consent. Limits, series, metric spaces, uniformity, integrals.
256. *Complex Variables*. II. 3 hr. PR: Math. 18 or 51. Complex numbers, functions of a complex variable; analytic functions; the logarithm and related functions; power series; Laurent series and residues; conformal mapping and applications.
261. *Mathematical Logic II*. II. 3 hr. PR: Phil. 106 or Math. 161 or consent. A more formal and rigorous approach to the material covered in Phil. 106; selected problems in the philosophy of mathematics and the philosophy of logic. (Equiv. to Phil. 206.)
269. *Advanced Topics in Mathematics*. I, II, S. 3-9 hr. PR: Consent. An independent but directed study program, the content of which is to be mutually agreed upon by the individual student and instructor.

271. *Projective Geometry*. II. 3 hr. PR: Math. 141, 241, or consent. Projective and affine spaces, transformation groups for planes. Introduction to axiomatic plane geometries.
- 291, 292. *Theory of Probability*. I, II. 3 hr. per sem. PR: Math. 18 or 51. Fundamental theorems. Development of density and distribution functions in the discrete and continuous cases. Classical problems and solutions. Moments, characteristics functions, limit theorems. Applications.
- 301, 302. *Combinatorial Analysis*. I, II. 3 hr. per sem. PR: One year of calculus. Permutations, combinations, generating functions, principle of inclusion and exclusion, distributions, partitions, compositions, trees and networks. (*Course will not be offered in 1978-79.*)
- 305, 306. *Theory of Numbers*. I, II. 3 hr. PR: One year of calculus. Introduction to classical number theory, covering such topics as divisibility, the Euclidean algorithm, Diophantine equations, congruences, primitive roots, quadratic residues, number-theoretic functions, distribution of primes, irrationals, and combinatorial methods. Special numbers such as those of Bernoulli, Euler, and Stirling.
313. *Intermediate Differential Equations*. II. 3 hr. PR: Math. 241, 252. A rigorous study of ordinary differential equations including linear and non-linear systems, self-adjoint eigenvalue problems, non-self-adjoint boundary-value problems, perturbation theory of autonomous systems, Poincare-theorem. (*Course will not be offered in 1978-79.*)
314. *Tensor Analysis*. II. 3 hr. PR: Math. 214, 252 (or 318). Inner product vector spaces, bilinear forms, tensors as multilinear forms, geodesic differentiation, theory of curvature of general manifolds.
315. *Operational Methods in Partial Differential Equations*. II. 3 hr. PR: Math. 113, 252, (or 318). Laplace transformation, properties and elementary applications; problems in partial differential equations; complex variable; problems in heat conduction, mechanical vibration, etc. Sturm-Liouville systems. Fourier transforms. (*Course will not be offered in 1978-79.*)
- 317, 318. *Advanced Calculus*. I, II. 3 hr. per sem. PR: Math. 18. Primarily for engineers and scientists. Functions of several variables, partial differentiation, implicit functions, transformations; line surface and volume integrals; point set theory, continuity, integration, infinite series and convergence, power series, and improper integrals.
319. *Seminar in Applied Mathematics*. 1-12 hr.
320. *Numerical Solution of Linear Equations*. 3 hr. PR: Math. 322 or consent. Numerical solution of large systems of linear equations using direct and iterative methods. Calculation of inverses and generalized inverses of matrices. Numerical methods for the determination of eigenvalues and eigenvectors. (Equiv. to C.S. 320.) (*Course will not be offered in 1978-79.*)
- 321, 322. *Introduction to Numerical Analysis*. I, II. 3 hr. per sem. PR: Math. 51 and Math. 241 or Math. 214 or consent. Approximation of functions, iteration procedures, numerical integration and differentiation, numerical solution of linear, and nonlinear equations, and ordinary differential equations, error analysis and pitfalls of computation. (Equiv. to C.S. 220 and 221.) (*Course will not be offered in 1978-79.*)
- 333, 334. *Foundations of Algebra*. S. 2 hr. per sem. PR: Calculus or consent. Not open to students with credit for Math. 141. Introduction to algebraic structures. Course is designed for high school teachers. Other students may be admitted with departmental approval obtained before registration.

- 335, 336. *Foundations of Geometry*. S. 2 hr. PR: Differential and integral calculus, or consent. A study of affine, projective, Euclidean, and non-Euclidean geometries. This course is designed especially for prospective high school mathematics teachers. Other students may be admitted with departmental approval obtained prior to registration.
- 337, 338. *Probability and Statistics*. S. 2 hr. per sem. PR: Calculus or consent. An introduction to probability theory, probability distributions, descriptive statistics, and statistical inference. Course is designed for high school mathematics teachers. Other students may be admitted with departmental approval obtained before registration.
339. *Special Topics*. I, II, S. 1-12 hr.
- 341, 342. *Modern Algebra*. I, II. 3 hr. per sem. PR: Math. 141 or consent. Concepts from set theory and the equivalence of the Axiom of Choice. Zorn's Lemma and the Well-Ordering Theorem; a study of the structure of groups, rings, fields, and vector spaces; elementary factorization theory; extensions of ring and fields; modules and ideals; and lattices.
343. *Linear Algebra*. I, II, S. 3 hr. PR: Math. 241 or consent. Review of theory of groups and fields; linear vector spaces including the theory of duality; full linear group; bilinear and quadratic forms; and theory of isotropic and totally isotropic spaces.
- 351, 352. *Theory of Functions of Real Variables*. I, II. 3 hr. per sem. PR: Math. 181, 252. A development of the Lebesgue integral, function spaces and Banach spaces, differentiation, complex measures, the Lebesgue-Radon-Nikodym theorem. (*Course will not be offered in 1978-79.*)
- 355, 356. *Theory of Functions of Complex Variables*. I, II. 3 hr. per sem. PR: Math. 252. Number systems, the complex plane and its geometry. Holomorphic functions, power series, elementary functions, complex integration, representation theorems, the calculus of residues, analytic continuation and analytic function, Elliptic functions, Holomorphic functions of several complex variables.
357. *Calculus of Variations*. II. 3 hr. PR: Math. 113, 252, (or 318). Necessary conditions and sufficient conditions for weak and strong relative minimums of an integral, Euler-Lagrange equation, Legendre condition, field construction, Weierstrass excess function, and the Jacobi equation.
- 381, 382. *Topology*. I, II. 3 hr. per sem. PR: Math. 252 or consent. A detailed treatment of topological spaces covering the topics of continuity, convergence, compactness, and connectivity; product and identification spaces, function spaces, and the topology in Euclidean spaces.
- 385, 386. *Rings of Continuous Functions*. I, II, S. 3 hr. per sem. PR: Math. 341 and Math. 381, or consent. A study of the algebraic structure of the ring of all continuous real-valued functions on a topological space and its relation to the topological properties of the space.
400. *Seminar in Number Theory*. I, II. 1-12 hr. (*Course will not be offered in 1978-79.*)
402. *Special Functions*. I, II. 3 hr. PR Math. 113, 252. Operational techniques, generalized hypergeometric functions, classical polynomials of Bell, Hermite, Legendre, Noerlund, etc. Introduction to recent polynomial systems. Current research topics.
- 405, 406. *Analytic Number Theory*. I, II. 3 hr. per sem. PR: Math. 306, 356. Selected topics in analytic number theory such as the prime number theorem, primes in an

arithmetical progression, the Zeta function, the Goldbach conjecture. (*Course will not be offered in 1978-79.*)

409. *Seminar in Special Functions.* I, II. 1-12 hr. (*Course will not be offered in 1978-79.*)
440. *Seminar in Algebra.* I, II. 1-12 hr. (*Course will not be offered in 1978-79.*)
- 441, 442. *Group Theory.* I, II. 3 hr. per sem. PR: Math. 141 or consent. Elementary group theory; Sylow theory, extended Sylow theory in solvable groups, Burnside's theorem on normal complements, transfer homomorphism. Representation theory. Emphasis throughout on finite groups. (*Course will not be offered in 1978-79.*)
- 443, 444. *Algebraic Theory of Semigroups.* I, II. 3 hr. per sem. PR: Math. 342 or equiv. Ideal theory, matrix representation of semigroups, decompositions and extensions, simple semigroups, inverse semigroups, congruence relations, recent research. (*Course will not be offered in 1978-79.*)
450. *Seminar in Analysis.* I, II. 1-12 hr. (*Course will not be offered in 1978-79.*)
- 451, 452. *Functional Analysis.* I, II. 3 hr. per sem. PR: Math. 181, 241, 252. A study of Banach and Hilbert spaces; the Hahn-Banach theorem, uniform boundedness principle, and the open mapping theorem; dual spaces and the Riesz representation theorem; Banach algebras; and spectral theory. (*Course will not be offered in 1978-79.*)
- 457, 458. *Theory of Partial Differential Equations.* I, II. 3 hr. per sem. PR: Math. 252. Cauchy-Kowalewski theorem, Cauchy's problem, the Dirichlet and Neumann problems, Dirichlet's principle, potential theory, integral equations, eigenvalue problems, numerical methods. (*Course will not be offered in 1978-79.*)
460. *Thesis.* I, II. 1-6 hr.
470. *Seminar in Geometry.* I, II. 1-12 hr. (*Course will not be offered in 1978-79.*)
- 471, 472. *Algebraic Geometry.* I, II. 3 hr. per sem. PR: Math. 141, 271. Foundations of affine geometry, the geometry of quadratic forms. Structure of the general linear group, symplectic groups, and orthogonal groups. (*Course will not be offered in 1978-79.*)
480. *Seminar in Topology.* I, II. 1-12 hr. (*Course will not be offered in 1978-79.*)
- ✓ 490. *Teaching Practicum.* I, II. 1-3 hr. PR: Consent. Supervised practices in college teaching of mathematics.
491. *Advanced Study.* I, II, S. 1-6 hr. PR: Consent. Investigation in advanced subjects which are not covered in regularly scheduled courses. Study may be independent or through specially scheduled lectures.
496. *Graduate Seminar.* I, II. 1 hr. PR: Consent. Each graduate student will present at least one seminar to the assembled faculty and graduate student body of his program.
497. *Research.* 1-15 hr.
499. *Graduate Colloquium.* I, II, S. 1-6 hr. PR: Consent. For graduate students not seeking coursework credit but who wish to meet residence requirements, use the University's facilities, and participate in its academic and cultural programs.

PHILOSOPHY

Philosophy

Phil.

253. *Philosophy of Mathematics*. I or II. 3 hr. PR: Phil. 106 or consent. Contemporary viewpoints in the foundations of mathematics. (*Course will not be offered in 1978-79.*)
272. *Philosophy of Law*. I or II. 3 hr. PR: 6 hr. in philosophy or law or pre-law student or consent. A philosophical, metatheoretical study of legal theorizing, a metaphysical investigation of the presuppositions of legal claims and an application of philosophical ethics to legal practices, concentrating on recent studies by philosophical analysts.
283. *Philosophy of History*. I or II. 3 hr. PR: 6 hr. in philosophy or history major or consent. Theoretical problems such as the nature of historical explanation, relativism, and the status of speculative principles of history. (*Course will not be offered in 1978-79.*)
285. *Philosophy of Language*. I or II. 3 hr. PR: 6 hr. in philosophy or linguistic or language major or consent. Philosophical problems concerning the nature of meaning and language.
290. *Directed Studies*. I, II, S. 1-6 hr. (May be repeated.) PR: Instructor's written consent. Individually supervised research and projects.
292. *Advanced Topics in Philosophy*. I or II. 3 hr. PR: 6 hr. in philosophy or consent. Advanced philosophical investigation of selected problems and issues. Topics will vary.
302. *Philosophy of Science*. I or II. 3 hr. Philosophical problems associated with the concepts and methodology of science.
303. *Theory of Knowledge*. I or II. 3 hr. Definitions of knowledge, truth, and belief. Problems associated with skepticism of induction, perception, introspection, memory and *a priori* knowledge.
304. *Symbolic Logic*. I or II. 3 hr. The logic of statements, relations and identity; introduction to the notions of consistency, completeness, and decidability.
305. *History of Philosophy*. I or II. 3-9 hr. Selected topics in the history of Western philosophy, usually with concentration on one of the following periods: ancient, medieval, modern, or recent.
306. *Metaphysics*. I or II. 3 hr. Traditional problems associated with universals and particulars, reality and experience, causality, space and time, matter and mind, the nature of the self, etc.
310. *Ethics*. I or II. 3 hr. Selected topics in metaethics, the study of problems connected with the meaning and justification of ethical judgments.
313. *Advanced Philosophy of the Social Sciences*. I or II. 3 hr. PR: Consent. Philosophical problems associated with the concepts and methodology of the social sciences.
321. *Seminar: Selected Topics*. 3-9 hr.
497. *Research*. 1-15 hr.

PHYSICS

The Department of Physics offers opportunities for graduate study and research leading to the degrees of Master of Science and Doctor of Philosophy with research specialties in the following areas: experimental solid state physics; (magnetic, electrical, ultrasonic, thermal and optical properties); theoretical solid state physics (Rare Earth and Actinide Magnetism, surface and interface phenomena, metal physics); the study of critical phenomena; nuclear spectroscopy; Mossbauer studies; theoretical and experimental research in electrostatics; classical and quantized field theories; theoretical studies in gas dynamics and combustion theory; theoretical and experimental investigations on the separation of impurities for coal; astrophysics; macromolecular physics and medical physics.

In addition to the M.S. and Ph.D. programs, the department offers a series of courses during the summer designed specifically for teachers who wish to improve their skills in physics or astronomy.

Applicants for graduate study in physics should have the equivalent of a bachelor's degree. Before the start of the first semester in which the students are enrolled, they are interviewed by members of the faculty concerning their physics backgrounds in order that they may be counseled concerning their initial plan of study.

The general Graduate School requirements for the Master of Science degrees are given in Part 2 of the *Graduate School Catalog*. Of the 30 hours of course work specified by the Graduate School, 6 may be earned in thesis research, another 12 are required as basic courses by the department, and the remaining 12 are chosen by the student and faculty advisers to fit the individual needs of the student. Students are often encouraged to diversify their studies by taking courses in related departments. Each student is required to complete a research project and write a thesis based on this project. In addition to the research areas listed above, the thesis may be on a project on the history or teaching of physics. Students must pass a written examination based on course work and an oral examination based on the thesis.

To be admitted to candidacy for the Ph.D. degree, students must pass written examinations in mechanics, electricity and magnetism, modern physics, quantum mechanics, thermodynamics, and optics. Following completion of additional course work at the advanced level, the candidates must pass a qualifying examination emphasizing mastery of their research areas. To receive the Ph.D., the student must complete a research project and successfully defend a dissertation based on this project and submit for publication a paper based on the dissertation research. Each candidate must satisfy the departmental language requirement in one language (French, German, or Russian), or show proficiency in computer programming.

In addition to the research facilities on campus, students may have access to the facilities at Oak Ridge National Laboratory through Oak Ridge Associated Universities Research Participation Grants. Under suitable conditions, students may obtain part-time employment on the research staff of the Morgantown Energy Research Center or the National Institute of Occupational Safety and Health. Research done at these off-campus facilities, if approved by the department, is applicable to the M.S. and Ph.D. degrees.

The course offered by the department for graduate study apart from those for education majors are essentially of three types. Physics 331, 333, 351-52, 383, and 387 serve as a nucleus of basic courses required of most students. A second group consists of standard electives offered in alternate years. The third type consists of

courses, listed as special topics or advanced research topics, which are either programs of independent study designed to suit the needs of the individual student or courses on some topic of current and lively interest.

Physics

201. *Special Topics*. I, II. 1-3 hr. (May be repeated to a maximum of 24 hours.) Study of topics of current interest in physics.
213. *Electronics*. I, II. 3 hr. PR: Physics 12. Theory, experiments and application of electronics; with laboratory. (*Course will not be offered in 1978-79.*)
225. *Atomic Physics*. I, II. 3 hr. PR: Physics 124 or equiv. Relativistic mechanics, atomic structure, and spectra.
- 231, 232. *Theoretical Mechanics*. I, II. 3 hr. PR: Physics 11, 12 or equiv. Scalar, vector, and tensor fields; curvilinear coordinate systems. Kinematics and dynamics of particles, systems of particles and rigid bodies. Lagrangian and Hamiltonian formulation. Relativistic motion.
- 233, 234. *Electricity, Magnetism, and Radiation Optics*. I, II. 3 hr. per sem. PR: Physics 11, 12 or equiv. Electrostatics, magnetostatics, introduction to electrodynamics, and applications to optics.
241. *Advanced Physics Laboratory*. I, II. 1-2 hr. Experiments in physics designed to implement theory courses, give experience in data taking and instrumentation, and learn methods of data evaluation and error analysis.
- 247, 248. *Physics Seminar*. I, II. No credit. Suggested for junior, senior, and graduate physics majors. These lectures acquaint students with topics of current interest in physics.
251. *Introduction Quantum Mechanics*. I. 3 hr. PR: Physics 124. Fundamental principles of quantum mechanics; state functions in position and momentum space, operators, Schrödinger's equation, applications to one-dimensional problems, approximation methods, the hydrogen atom, angular momentum and spin.
263. *Nuclear Physics*. I, II. 3 hr. PR: Physics 11, 12 or equiv.; Physics 124. Study of characteristic properties of nuclei and their structure as inferred from nuclear decays and reactions, leading to a knowledge of nuclear forces and models.
271. *Solid State Physics*. II. 3 hr. PR: Physics 124 or equiv. Properties of crystalline solids: includes crystal structure, binding, lattice vibrations and an investigation of thermal, electrical, magnetic, and optical phenomena based on energy band theory.
283. *Thermodynamics*. II. 3 hr. PR: Physics 11, 12 or equiv. Introduction to the statistical foundations of thermodynamics. Application of the fundamental laws of thermodynamics to physical and chemical systems.
284. *Kinetic Theory*. II. 3 hr. PR: Calculus, Physics 11, 12 or equiv. The concepts of probability which lead to the derivation of the Boltzman, fermi-Dirac, and Bose-Einstein statistics. Application of these statistics to physical and chemical systems. (*Course will not be offered in 1978-79.*)
301. *Special Topics*. I, II. 1-6 hr. (May be repeated to a maximum of 24 hours,) PR: Consent. Primarily for Graduate students. Specialized topics of current interest in physics.

313. *Introductory Electronics*. S. 3 hr. PR: 1 year college physics. Primarily for Education majors, principles and applications of electrical components and circuits, including solid-state electronics.
318. *Air Pollution Meteorology*. II. 3 hr. PR: 1 year college physics, calculus. Primarily for students in Engineering (air pollution). Summary of descriptive and dynamic meteorology relevant to air pollution. Dispersal of pollutants from a point source. Special topics of current or particular interest.
321. *Optics*. I, II. 3 hr. PR: Physics 11, 12 or equiv. A basic course in physical optics covering radiation theory, diffraction, interference, polychromatic waves, scattering, polarization, double refraction, and selected topics in quantum optics.
331. *Advanced Classical Mechanics*. I. 3 hr. PR: Physics 231, 232, and differential equations. Lagrange and Hamilton form of equations of motion, rigid bodies, small and nonlinear oscillations. Transformation theory relativistic dynamics, and systems with an infinite number of degrees of freedom.
333. *Advanced Electricity and Magnetism*. II. 3 hr. PR: Physics 233, 234, and differential equations. Electrostatic and magnetostatic boundary value problems. Maxwell's equations for time varying fields. Green's functions and integral representations; applications to radiation, diffraction, wave guides, plasma physics, and relativistic motion of charged particles.
- 351, 352. *Quantum Mechanics*. I, II. 3 hr. per sem. PR: Physics 225, 251. Covers a wide range of topics of current interest at a level such that a student should be able to read basic research papers in many fields upon completion. Topics covered include: approximation methods, representation theory, angular momentum, relativistic quantum mechanics, time dependent perturbation theory, identical particles, scattering, molecules, solids, magnetism, and second quantization of bosons and fermions.
354. *Introduction to Modern Physics*. S. 3 hr. PR: 1 year of introductory college physics. Primarily for Education majors; not open to Physics majors. Elementary study of atomic and molecular structure and spectra, solid state and nuclear physics, relativity and elementary particles.
- 355, 356. *Workshop for Physics Teachers*. SI, SII. 3 hr. per sem. PR: 1 year of college physics, 1 year of college mathematics. Primarily for education majors; not open to physics majors. Techniques of apparatus construction and demonstration.
357. *Photography*. SI. 3 hr. PR: 1 year of college physics or equiv. The physics and chemistry of photography with practical experience. Primarily for education majors; not open to physics majors.
358. *Light*. SII. 3 hr. PR: 1 year of college physics or equiv. A demonstration course designed to illustrate the basic concepts covering light and optics. Primarily for education majors; not open to physics majors.
- 361, 362. *Molecular Physics*. I, II. 3 hr. per sem. PR: Physics 225. A presentation of the theory of molecular structure and spectra.
383. *Statistical Mechanics*. II. 3 hr. PR: Physics 283, 351, 352. Classical statistics; Boltzmann, Fermi-Dirac and Bose-Einstein statistics, theory of fluctuations and applications to physical systems.
387. *Mathematics for Physicists and Engineers*. I. 3 hr. PR: Calculus, differential equations, Physics 11, 12 or equiv. Complex variables: series, contour integration and conformal mapping; ordinary differential equations; Fourier series; Laplace trans-

forms; Fourier transforms; special functions; Bessel functions and Legendre, Hermite, and Laguerre polynomials; introduction to partial differential equations; Poisson's equation, Wave equation, and diffusion equation.

388. *Mathematics for Physicists and Engineers*. II. 3 hr. PR: Physics 387 or equiv. Infinite dimensional linear vector spaces; series and Green's function methods of solution of partial differential equations; variational methods. Applications in electricity and magnetism, fluid mechanics, diffusion heat flow, propagation, and scattering phenomena.
401. *Advanced Research Topics*. I, II. 1-6 hr. (May be repeated to a maximum of 24 hours.) PR: Consent. Specialized topics in field of physics related to the research interests of the department. Open only to students who have completed most of the basic graduate courses.
410. *High Energy Physics*. I. 3 hr. PR: Physics 351, 352. Fundamental particle interactions, field theory, s-matrix expansions, space time symmetries, internal symmetries, unsolved problems. (*Course will not be offered in 1978-79.*)
453. *Advanced Quantum Mechanics*. I. 3 hr. PR: Physics 351, 352. Study of relativistic theory, many electron systems, introduction to quantum electrodynamics. (*Course will not be offered in 1978-79.*)
- 463, 464. *Advanced Nuclear Physics*. I, II. 3 hr. per sem. PR: Physics 225, 263, and 251. Detailed presentation of nuclear models, nuclear reaction mechanism, nuclear forces and theories of nuclear disintegrations.
471. *Advanced Solid State Physics*. II. 3 hr. PR: Physics 271, 325, 351. Advanced treatment of solid state theory: electronic, vibrational, transport, thermodynamic and magnetic properties of solids. (Taught in alternate years). (*Course will not be offered in 1978-79.*)
497. *Research*. I, II. 1-15 hr.

Astronomy

Physics

216. *Astronomy for Teachers*. S. 3 hr. PR: Consent. Basic concepts and methods in astronomy and how to teach them using the celestial sphere and geometrical tools. Observational work at night. The use of a telescope and camera.
255. *Intermediate Astronomy*. II. 3 hr. PR: Math. 16 or consent. Measurement of the universe; trigonometric parallax, statistical parallax, moving clusters, cluster H-R diagrams, masses of various binary systems, Kepler's laws, and the three-body problem.
267. *Basic Astrophysics*. I, II. 3 hr. PR: Physics 124 or equiv. The several equations of state, the Boltzmann-Saha equation, the H-R diagrams and interpretation of spectra, introduction to radiative transfer and stellar structure.
268. *Galactic Dynamics*. I, II. 3 hr. PR: Astron. 255. The kinematics and dynamics of the galaxy. Methods for determining the rotation parameters of the Milky Way galaxy from radial velocities and proper motions. (*Course will not be offered in 1978-79.*)

POLITICAL SCIENCE

The graduate program in political science at WVU extends through the Doctor of Philosophy degree. Emphasis is placed upon more extensive and intensive

training than is possible on the undergraduate level. This involves: (1) the development of a broader knowledge of the literature of political science; (2) some degree of specialization in one of the major areas of the discipline; (3) training in the identification and analysis of problems in governmental theory and practice; and (4) a special program of instruction for students wishing to develop research skills for the public service.

Master of Arts (Professional Option)

Eligibility. Regular applicants for the Master of Arts degree (Professional Option) should present a minimum of 12 semester hours of undergraduate credit in political science. In addition, the prospective student should have a minimum 2.5 overall grade-point average at the undergraduate level and should submit two letters of recommendation from faculty familiar with the student's work. Finally, students must submit the results of the Graduate Record Examination (both general aptitude and advanced area).

Students may be admitted on a "Regular with Deficiencies" basis or "Special Provisional Status." Such students also must submit Graduate Record Examination scores and two letters of recommendation. Students admitted in the above categories may be required to:

a. enroll in 9 semester hours of 200-level political science courses during the first semester and achieve at least a 3.0 grade-point average at the end of that semester or,

b. enroll in 12 semester hours of 100-level political science courses during the first semester for non-credit and achieve a 3.0 grade-point average at the end of that semester, or,

c. complete a combination of the above as determined by the graduate adviser.

Course Requirements. To be in good standing in the Master of Arts program, a student must maintain an average of 3.0 in political science each semester.

Admission to candidacy for the Master of Arts degree in political science requires that the student complete 33 graduate credit hours (exclusive of Pol. Sci. 499, Colloquium), of which 27 hours must be in political science. Students may offer up to 6 hours in a cognate field if justified by the student's total program and approved by the department. All graduate students must enroll in Pol. Sci. 499, Colloquium, each semester.

All students will be required to take at least one pro-seminar course in each of four designated areas of Political Science — i.e., American Government and Politics, Comparative Politics, International Relations, and Political Theory. Students also are required to take at least 3 hours of seminar work in two of the fields (400-level courses) and an additional 6 hours of methodology.

The preparation of a master's thesis is optional. If the student elects to write a master's thesis in lieu of course work, the thesis will carry 6 credit hours. The program options are:

Non-Thesis Option — Total of 33 hours: Methodology, 6 hr.; Proseminars, 12 hr.; Seminars, 6 hr.; Electives, 9 hr. in courses at 200-level or above.

Thesis Option — Total of 33 hours: Methodology, 6 hr.; Proseminars, 12 hr.; Seminars, 6 hr.; Electives, 3 hr.; Thesis, 6 hr.

Students are required to spend at least one semester in residence enrolled in a full-time graduate program of no less than 9 semester hours for that semester. Two summer sessions may count as one semester.

Final Examination. Students will be expected to pass final written examinations in two of the four fields of political science — American

Government and Politics, Comparative Politics, International Relations, and Political Theory. The student will select the two fields in which the student wishes to be examined. In addition, each student will submit two research papers (one from each area of specialty designated by the student) as evidence of research competence. Students who elect to write a thesis will submit their thesis instead of research papers. Finally, an oral examination may be required if performance on the written examinations leaves doubt as to the student's mastery of the subject. Students who fail final written examinations may be allowed to retake them at the next regularly scheduled examination period. It is contrary to departmental policy to give a third examination.

Master of Arts (Political Economy Option)

The purpose of the Political Economy Option is to train students in the fields of political science and economics; to provide them with the necessary analytical and research skills to become competent researchers, particularly in regard to public policy problems; and to provide field experience on an optional basis through a "research practicum" in a public agency.

Eligibility. Applicants for the Master of Arts Degree (Political Economy Option) should have a B.A. in Political Science (with a minimum of 6 hours in Economics) or a B.A. or B.S. in Economics (with a minimum of 6 hours in Political Science). In addition, the applicant should have an overall grade-point average of 2.5, and should submit two letters of recommendation from faculty familiar with the student's work. Students should also submit the result of the Graduate Record Examination (General Aptitude).

Course Requirements. To have good standing in the M.A. program, a student must maintain an average of 3.0 each semester.

Admission to candidacy for the M.A. degree requires that the student complete a minimum of 36 hours (exclusive of Colloquium) in a specialized curriculum offered by the Department of Political Science and the Department of Economics. This curriculum includes courses in Micro and Macro Economics, Regional Economics, State and Local Government, Intergovernmental Relations, and Public Policy Analysis. In addition, students must complete work in Political Science Methodology and Statistical Methods. All students must enroll in Pol. Sci. 499, Colloquium, each semester in residence.

The Political Economy Option provides an optional Research Practicum during the fourth semester of work. The practicum enables the student to conduct actual policy research in a public agency. The practicum will carry an additional 6 hours of graduate credit.

Final Examinations. Students will be expected to pass final written examinations in two fields — Economics and Policy Analysis. An oral examination may be required if performance on the written examinations leaves doubt as to the student's mastery of the subject. Students who fail written examinations may be allowed to take them at the next regularly scheduled examination period. It is contrary to departmental policy to give a third examination.

Doctor of Philosophy

Eligibility

Applicants for the Doctor of Philosophy degree should present a Master's degree in Political Science or a recognized sub-field thereof. Applicants who have Master's degrees in progress may apply and be admitted conditionally, pending

completion of the M.A. degree within the first semester in the Ph.D. program. In addition, the prospective student should have a 3.0 grade-point average at the graduate level and should submit three letters of recommendation from faculty familiar with the student's work. Finally, students must submit the results of the Graduate Record Examination (both general aptitude and advanced area).

The department does not provide for provisional admission of Ph.D. students.

Course Requirements

To have a good standing in the Doctor of Philosophy program, a student must maintain a minimum grade-point average of 3.0 in political science each semester. Students are required to spend at least one year (two semesters) in residence enrolled in a full-time graduate program of no less than 9 semester hours each semester. All graduate students must enroll in Pol. Sci. 499, Colloquium, each semester.

All students must present two methodology courses: Pol. Sci. 300 and Pol. Sci. 400. In addition, students must complete no less than 12 hours in Seminars or other courses at the 300 or 400 level. If the student does not have a WVU Master's degree or has not taken the Proseminars, 12 hours of Proseminars must be completed in American Government and Politics, Comparative Politics, International Relations, and Political Theory. Twelve hours of electives (in courses at the 200-level or above) may be taken in political science or another discipline if such courses are (1) related to the student's areas of concentration; (2) not used as a substitute for the curriculum in political science; and (3) approved by the student's faculty adviser.

All students must complete a research tool skill requirement which is based on the student's needs and total program of study. There are four options in satisfying this requirement: (1) reading competence in two foreign languages with aid of dictionary; (2) reading competence in one foreign language without aid of dictionary; (3) reading competence in one language with aid of dictionary and completion of 6 credit hours in statistics and/or computer science; and (4) completion of 9 credit hours in statistics and/or computer science. If none of these options are relevant to the student's program and individual needs, then petition may be made to the department for a substitute.

Final Examination

Before admission to candidacy for the Doctor of Philosophy degree, students will be expected to pass final written examinations in three of the four fields of political science — American Government and Politics, Comparative Politics, International Relations, and Political Theory. An oral examination may be required if a student receives a "conditional pass" on the written examination.

Dissertation

Upon admission to candidacy for the Doctor of Philosophy degree, the candidate must select a topic for a dissertation under the direction of the candidate's adviser, complete a dissertation which makes a contribution to knowledge in the candidate's area of concentration, and pass an oral examination based primarily upon the dissertation. After successful completion of the oral examination, the candidate will be recommended for the degree.

Financial Assistance

Students interested in financial assistance should apply directly to the Department of Political Science.

Political Science

Pol. Sci.

200. *Introduction to Political Behavior*. I, II. 3 hr. PR: Upper-division standing. Course stresses the understanding of methods, theories, and substantive interests identified with behavioral approach to the study of politics. Descriptive statistics and the use of the Statistical Package for the Social Sciences are included.
210. *The American Presidency*. I, II. 3 hr. Institutional, behavioral and societal forces which have given rise to the modern presidency; factors which enhance and constrain the exercise of the presidential power over those constituencies with which he must interact; the nature and consequences of the presidential decision-making process; desirability and/or feasibility of reforming the Presidency.
211. *Problems of American National Government*. I, II. 3 hr. An examination of selected problems in American government and politics. (*Course will not be offered in 1978-79.*)
213. *American Constitutional Law*. I. 3 hr. PR: Pol. Sci. 2 or consent. (Primarily for juniors and seniors as well as graduate students.) Basic principles of American constitutional law as developed through court interpretations based on precedents rooted in an English-derived colonial heritage. Special emphasis on the division and separation of powers, the implementation of rights by court decisions expanding their effect through "incorporation," and the strategic significance of judicial review. Major constitutional controversies as treated by courts and judges are examined in the light of the facts and from the standpoint of theory in order to reach tenable conclusions as to the role of the judiciary in America. Case method of instruction.
214. *Civil Rights and Liberties in the United States*. II. 3 hr. PR: Pol. Sci. 213 or consent. The scope and meaning of civil liberty guarantees in the United States Constitution, as illustrated by cases involving original constitutional provisions, the Bill of Rights, and Civil War amendments with special attention to the rule of law; free speech, press, religion, assembly, and petition; personal security; racial discrimination; and the labor problem.
215. *American Constitutional Development I*. I. 3 hr. PR: Pol. Sci. 2 or consent. American constitutional development, with special emphasis on origins of constitutionalism here; liberty vs. government; mixed government; separation of powers; problem of federalism and Philadelphia Convention of 1781; Marshall court and establishment of judicial review; Federalist vs. States Rights construction of Constitution; Jacksonian influences; Taney Court prelude to Civil War, secession, and conflict, heralding constitutional change.
216. *American Constitutional Development II*. II. 3 hr. PR: Pol. Sci. 2, 215, or consent. American constitutional development, with special attention to reconstruction, Supreme Court, and Fourteenth Amendment; *Laissez-faire* and commerce clause; stirrings of reform toward a constitutional revolution under New Deal; changing federal-state relationships; impact of war on constitutional interpretation; expanding role of the president in domestic matters and foreign relations; the Warren Court, the Burger Court dominated by Nixon-Ford judges.

221. *West Virginia Government and Administration*. I, II. 3 hr. Organization and operation of the state government of West Virginia.
225. *Municipal Government*. I. 3 hr. Legal basis, structure, processes and politics of urban governments and cooperative-conflict relations with other governmental units.
226. *Problems of State and Local Government*. I, II. 3 hr. PR: Pol. Sci. 120 or equiv. Change processes in state and local systems in the context of federalism.
231. *History of Political Parties*. I. 3 hr. Growth of political parties in the United States. Issues in presidential campaigns as they relate to political party development. (*Course will not be offered in 1978-79.*)
232. *Public Opinion and Propaganda*. I, II. 3 hr. The formation, measurement, and impact of public opinion in the American and cross-national contexts.
233. *Current Political Issues*. I. 3 hr. Political party platforms and the major issues of the political campaign. (*Course will not be offered in 1978-79.*)
234. *The Legislative Process*. II. 3 hr. Structure and organization of legislative bodies. Powers of legislature. Detailed study of law-making procedures. Influence of outside forces.
235. *Energy/Environmental Policies and Politics*. II. 3 hr. PR: Pol. Sci. 2, 120, 135, or consent. Focus on U.S. policies, programs, and politics in the energy and environmental areas.
236. *Energy/Environmental Policies and Politics*. II. 3 hr. PR: Pol. Sci. 2, 120, or 135. Focus on U.S. policies, programs, and politics in the energy and environmental areas.
240. *Public Administration and Social Change*. I, II. 3 hr. PR: Pol. Sci. 140. The study of government and administrative organization in their relationships to the sources of change— social, cultural, economic, technological, and environmental — in American society.
244. *Administrative Law and Regulation*. II. 3 hr. PR: Pol. Sci. 140 or consent. The law of public administration, primarily by case method, covering administrative powers and limitations, procedure in administrative adjudication and rule-making, discretion, ultra vires as check on administrators, notice and hearing, administrative penalties, judicial control and administrative liability.
246. *Comparative Public Administration*. II. 3 hr. Theory and practice of public administration in diverse cultures and national political systems.
250. *Government of Japan*. II. 3 hr. Survey of political institutions and governmental process of Japan with special emphasis on the analysis of political problems in the postwar period.
251. *Government of Soviet Union and Eastern Europe*. II. 3 hr. PR: Pol. Sci. 1 or 2. Survey of the political non-democratic governments of the Soviet Union and its Eastern European satellites, with special reference to the guiding role and development of Marxism-Leninism.
252. *British Government and Politics*. II. 3 hr. Intensive study of British government with emphasis on internal and external policies, primarily during twentieth century.
253. *Contemporary Governments of the Commonwealth*. II. 3 hr. Political relationships between members of Commonwealth. Comparative study of governments and politics of the dominions, with particular reference to Canada and Australia.

254. *Government of China*. I. 3 hr. Survey of political institutions, and governmental process of Communist China with a special emphasis on the analysis of political problems since 1949.
255. *Governments of Latin America*. I. 3 hr. Comparative study of the major nations of Latin America.
256. *Governments of the Middle East*. II. 3 hr. Governments and political forces of the Middle East.
258. *Politics of Africa*. II. 3 hr. Historical legacies and current political processes of tropical African countries.
261. *International Organization*. II. 3 hr. Agencies created since close of World War II. Some reference to development of international law and United Nations.
263. *Public International Law*. I. 3 hr. Law governing relations among nations, including development of rules, means of enforcement, and conflicts between theory and practice.
264. *Conduct of American Foreign Relations*. I. 3 hr. Concepts about and factors influencing the formulation and execution of United States foreign relations; analysis of past policies and current issue areas in relations with major developed and developing nations and international organizations.
266. *Soviet Foreign Policy*. II. 3 hr. Concepts about and factors influencing the formulation and execution of Soviet foreign relations; analysis of past policies and current issue areas in relations with major developed and developing nations and international organizations.
267. *Latin America in International Affairs*. II. 3 hr. Relations of Latin American states among themselves, with the United States, the United Nations, regional organizations, and non-western states. Analysis in depth of the Monroe Doctrine and its corollaries, and the inter-American system.
268. *Inter-State Conflict in international Affairs*. II. 3 hr. PR: Pol. Sci. 160 or consent. Conflict in inter-state relations, in particular armed conflict between nations. Attention to the role of force, impact of modern technology and nuclear weaponry, theoretical and research approaches to causes and nature of conflict, and different modes of conflict control and resolution.
269. *Far Eastern International Relations*. II. 3 hr. International relations of Far Eastern countries with emphasis on historic roots of recent conflicts, the competitive role of the United States and the Soviet Union, confrontation between the communist and anticommunist countries in the region, and the regional cooperation and security problems in the post-war period.
270. *History of Political Thought: Plato to Machiavelli*. I. 3 hr. Major political ideas from the Greeks to sixteenth century with special emphasis upon development of natural law and western conception of justice.
271. *History of Political Thought: Machiavelli to Bentham*. II. 3 hr. PR: Pol. Sci. 270 or consent. Political ideas which developed from the separation of faith and reason, the culmination of this movement in rational integral liberalism, and the origins of modern conservatism as expounded by Edmund Burke.
272. *Recent and Contemporary Political Thought*. I. 3 hr. Examination of integral liberalism and the forces leading to the decline of liberalism and a critical analysis of the

fascist and communist ideologies with their threat to the traditions of western civilization embodied in Christianity and conservatism.

273. *American Political Theory*. I, II. 3 hr. Major political ideas and their influence upon American society and government from seventeenth century to present.
275. *Foundations of Jurisprudence*. II. 3 hr. Inquiry into: (a) nature, end, and sanctions of law; its sources, forms, and modes of growth, as evidenced in typical legal systems; general juristic conceptions of rights, duties, and liabilities as well as persons, acts, and things; (b) main schools of jurisprudence — analytical, historical, philosophical, sociological, and that of legal realism; (c) economic interpretation of law and its relation to property and interest; (d) problem of legal rule versus discretion; (e) meaning of obligation, with special reference to contract; (f) stages in the development of legal institutions, forms and procedures (as exemplified in trials); (g) significant theories about law including the Marxian “aberration,” and (h) status of law in today’s world.
279. *Analysis of Political Behavior*. II. 3 hr. Examines political behavior in terms of recent behavior theories emanating from a variety of disciplines.
299. *Special Topics*. I, II. 1-3 hr. Supervised reading, research, special projects, or field experience. Instructor’s written consent.
300. *Introduction to Political Science Methodology*. I. 3 hr. General structure of political science methodology with emphasis on constructing research hypotheses, data collection and analysis, scientific approach to political problemsolving, interpretation of quantitative analysis, and research project.
310. *American Political Institutions*. I. 3 hr. A systematic and critical treatment of the major theoretical perspectives and research findings in the field of American politics. Intended primarily for graduate students.
335. *Theory of Public Policy Development*. II. 3 hr. PR: Pol. Sci. 235 or equiv. Review and assessment of current efforts to develop theories of public choice in the American political system. The role of the policy analyst is examined.
345. *Public Administration and Policy Development*. II. 3 hr. PR: Pol. Sci. 140 or consent. Decision-making and policy development in the administrative process by the case method.
350. *Proseminar in Comparative Politics*. I. 3 hr. PR: Graduate standing. A survey of traditional, contemporary deductive, and contemporary inductive approaches to comparative politics, with particular attention to recent cross-national methodologies and research findings.
351. *Politics of Planned Development*. I. 3 hr. Political aspects of social, economic, and technological change, with special reference to the politics of development planning and administration.
352. *Leadership and Authority in Africa*. II. 3 hr. Traditional, colonial, and contemporary political leadership and authority patterns in Africa south of the Sahara. (*Course will not be offered in 1978-79.*)
353. *The Theory of Political Development*. II. 3 hr. PR: Graduate standing or consent. Contemporary theories of political stability and change in relation to social and economic processes occurring within newly independent countries and selected sub-national regions. (*Course will not be offered in 1978-79.*)

360. *Proseminar in International Relations*. I. 3 hr. PR: Graduate standing. An intensive and systematic critical analysis of contemporary theory and research representative of the major foci in international relations.
370. *Proseminar in Political Theory*. II. 3 hr. PR: Pol. Sci. 270, 271, or consent. A survey course designed for graduate students which covers the major trends within political theory. Perennial questions of political theory, such as property, liberty, state power, and the good political system.
400. *Scope and Methods of Political Science*. II. 3 hr. PR: Pol. Sci. 300 or consent. Investigation of advanced topics in political research methodology with particular reference to the conceptual and technical problems of basic research in political behavior. Required of doctoral students.
403. *Internship*. I, II. 6-9 hr. per sem.; students may enroll more than once. PR: Consent.
- 410, 411. *Directed Reading and Research in American National Government*. I, II. 2-4 hr. per sem.; students may enroll more than once.
419. *Seminar in American National Government*. I, II. 3 hr. PR: Consent.
- 420, 421. *Directed Reading and Research in State Government*. I, II. 2-4 hr. per sem.; students may enroll more than once.
- 425, 426. *Directed Reading and Research in Local Government*. I, II. 2-4 hr. per sem.; students may enroll more than once. PR: Pol. Sci. 225 or consent.
429. *Seminar in State and Local Government*. I, II. 3 hr. PR: Consent.
- 430, 431. *Directed Reading and Research in Politics*. I, II. 2-4 hr. per sem.; students may enroll more than once. PR: Pol. Sci. 130 or consent.
439. *Seminar in Policy Analysis*. I. 3 hr. PR: Pol. Sci. 335 or consent.
- 440, 441. *Directed Reading and Research in Public Administration*. I, II. 2-4 hr. per sem.; students may enroll more than once. PR: Pol. Sci. 140 or consent.
- 450, 451. *Directed Reading and Research in Comparative Government*. I, II. 2-4 hr. per sem.; students may enroll more than once.
459. *Seminar in Comparative Government*. II. 3 hr. PR: Consent.
- 460, 461. *Directed Reading and Research in International Relations*. I, II. 2-4 hr. per sem.; students may enroll more than once.
469. *Seminar in International Relations*. II. 3 hr. PR: Consent.
- 470, 471. *Directed Reading and Research in Political Theory*. I, II. 2-4 hr. per sem.; students may enroll more than once.
479. *Seminar in Political Theory*. I. 3 hr. PR: Consent.
480. *Thesis*. I, II. 2-6 hr.
497. *Research*. 1-15 hr.
499. *Colloquium*. I, II. 1-6 hr.

PSYCHOLOGY

Admission. Students are admitted only at the beginning of the first semester. Applications must be completed by the preceding February 15. Acceptance will be based on: (1) adequate academic aptitude at the graduate level as measured by the Graduate Record Examination; (2) a minimum grade-point average of 2.5 (C +); (3) personal qualities in the applicant which are predictive of success in graduate study and satisfactory professional placement after graduation; (4) adequate preparation in the biological and social sciences, experimental psychology, and statistics. By permission, deficiencies in preparation may be made up after admission to the department. Students are expected to maintain a 3.0 (B) average in their psychology courses during the first graduate year, and to present a final 3.0 average in all psychology courses attempted.

Special Graduate Students. Graduate courses in psychology are open only to regular graduate students except by special departmental permission.

Master of Arts Degree (M.A.). Two years of full-time study with a minimum of 48 hours of credit are required for the M.A. degree. Six hours of credit may be counted for the M.A. thesis if such thesis is required by the option chosen by the student. The following options are available for the M.A. degree:

1. *Intermediate Degree for Ph.D. Candidates.* Students who are candidates for the Ph.D. are expected to complete an M.A. thesis and will receive the M.A. degree upon completing the thesis and credit hour requirements.

2. *Professional M.A. Degree in Clinical Psychology.* This program prepares the student for work in mental hospitals, mental health clinics, school mental health programs, and the like. No thesis is required.

Doctor of Philosophy Degree (Ph.D.). The doctoral programs aim to prepare a small number of well-qualified psychologists for four types of careers: (1) teaching and research in behavior analysis; (2) teaching and research in life-span developmental psychology; (3) teaching and research in educational psychology; and (4) teaching, research, and practice in clinical psychology. All doctoral programs require an academic year of supervised college teaching. A calendar year in an approved internship setting is required of all clinical students.

Students are accepted for study toward the Ph.D. objective upon entry into the department. They are formally admitted to doctoral study only after completion of the master's degree or its equivalent and may be subject to a screening examination to determine their readiness for doctoral work. During the first year of graduate work beyond the master's degree, the student will be admitted to a comprehensive preliminary examination in which competence must be demonstrated in the major area of specialization and a knowledge of such other areas of psychology as may be required of all graduate psychology students.

Upon passing the preliminary examination, the student will be formally promoted to candidacy for the doctorate. The student will then be assigned a committee which will direct further course work and the dissertation research, and will approve the internship setting.

After completion of a satisfactory dissertation and all other requirements, the candidate will take a final examination, written or oral, concerning the major emphasis and the dissertation.

Psychology

Psych.

213. *Directed Studies*. I, II, S. 1-3 hr. PR: Consent. Individually supervised reading, research and/or classroom management projects. No more than 12 hours may be applied to the 42 hours of psychology to which majors are limited.
218. *History and Systems of Psychology*. I or II. 3 hr. Survey of psychology, from its origins in philosophy, biology, and physics, through the several major schools of psychological thought to modern perspectives of behavior.
219. *Survey of Psychology*. I. 1 hr. PR: Psychology major. Overview of modern psychology with special reference to problems of graduate and professional training and employment opportunities.
223. *Learning and Memory*. I or II. 3 hr. Theoretical and empirical issues in human and animal learning and memory with emphasis on mechanisms of memory, language, verbal behavior, and conceptual processes.
224. *Experimental Analysis of Behavior*. I or II. 3 hr. Laboratory and lectures survey research in operant conditioning and its implications for behavior theory and applications.
225. *Cognition and Perception*. I or II, S. 3 hr. Current issues and theory in human perception, thinking, language, and information processing.
232. *Physiological Psychology*. I or II. 3 hr. Introduction to the biological foundations and the physiological mechanisms of behavior.
242. *Prenatal and Infant Behavior*. I or II, S. 3 hr. Early influences upon behavior and development are investigated; topics include behavioral genetics, hazards of parental development, sensor and motor development, language development, and socio-emotional development.
243. *Child and Adolescent Behavior*. I or II, S. 3 hr. Theory and research on the major psychological processes in childhood and adolescence are explored including maturation, personality, socialization, sensory and cognitive development.
245. *Adulthood and Aging*. I or II. 3 hr. Cognition and personality changes from maturity to old age. Psychological reactions to physiological change and to the establishment and dissolution of family units. Problems of intergenerational differences in adult behavior.
251. *Social Psychology*. II. 3 hr. Social factors which determine human behavior. Survey of the results of laboratory research in social psychology and its implications for social phenomena.
262. *Assessment of Behavior*. I or II. 3 hr. Theory and practice in development and use of psychological assessment procedures. Includes intelligence testing, behavioral assessment, interviewing.
263. *Comparative Personality Theory*. I, II. 3 hr. Theoretical and empirical readings in a comparative survey of major perspectives in personality theory, including dynamic, cognitive, humanistic, and behavioral theories of personality.
264. *Psychology of Adjustment*. I, II, S. 3 hr. Dynamic principles of human personality adjustment.

274. *Survey of Behavior Modification*. I. 3 hr. Behavior therapy and modification including desensitization, covert sensitization, interpersonal skill training; aversion techniques and applied behavior analysis employing operant principles.
279. *Community Psychology*. I. 3 hr. Psychological principles applied to treatment and intervention strategies at the community level. Manpower development, organizational change, and systems analysis.
281. *Abnormal Psychology*. I or II. 3 hr. Major categories of behavioral disorders, e.g., neuroses, psychoses, and character disorders are considered in terms of etiology, treatment, outcome, and prevention.
282. *Exceptional Children*. I or II. 3 hr. Study of children who present psychological problems: (1) exceptional mental retardation or advancement; (2) organic disabilities having behavioral consequences, such as cerebral palsy or deafness; (3) behavior disorders.
301. *Personnel Psychology*. I or II. 3 hr. PR: Stat. 101, or equiv. Application of psychological principles and techniques to the problems of measurement and prediction of proficiency in industry and society.
304. *Leadership and Human Relations in Working Groups*. I or II. 1-3 hr. PR: Consent. Individual work related to either research or practice in the field of human relations training programs.
307. *Practicum in Industrial Interviewing*. I or II. 3 hr. PR: Psych. 201 or consent. Intensive review of principles of selection and validation. Practice interviews applying non-directive techniques in employment and other types of interview.
311. *Research Design in Psychology*. I. 3 hr. PR: Elementary statistics and consent. For majors only. Issues and elements of empirical inquiry, quantification of concepts, manipulation, controls and confounds, examination of exemplary research designs in specific content areas of psychology.
312. *Data Analysis in Psychology*. II. 3 hr. PR: Psych. 311 or consent. For majors only. Inferential statistics, analysis of variance, simple correlation and regression, special topics in data analysis in psychology.
313. *Directed Study*. I, II, S. 1-3 hr. per sem. PR: Consent. Directed reading and research in special areas. (Undergraduates register for such projects under Psych. 213.)
314. *Theory of Tests and Measurement*. I. 3 hr. PR: Elementary statistics and consent. Theory underlying psychological scaling, mathematical models, classical psychometrics. Introduction to concepts of reliability, validity, correlation and regression, multivariate analysis procedures. (Course will not be offered in 1978-79.)
315. *Multivariate Analysis*. I or II. 3 hr. PR: Psych. 311, or 314, or equiv., and consent. Correlational methods in psychology with application to typical research problems. Includes simple matrix algebra, multiple correlation, discriminant analysis, and an introduction to factor analysis. (Equiv. to Stat. 341.)
321. *Sensory Processes*. I or II. 3 hr. PR: Psych. 121, or 122, or equiv. Psychophysics of vision and audition are analyzed and related to current theories. Methods of research on sensory processes are reviewed. (Course will not be offered in 1978-79.)
322. *Conditioning and Learning*. I or II. 3 hr. PR: Psych. 122, consent. Review of current research in operant and classical conditioning. Controversial issues in learning are reviewed in light of recent research and theories.

323. *Perceptual and Cognitive Processes*. I or II. 3 hr. PR: Psych. 121, or equiv. Consideration of classical and contemporary research and theory on perception and cognitive processes, including concept formation and thinking.
324. *Motivation*. I or II. 3 hr. PR: Psych. 121, or 122, or equiv. Survey of experimental data and theory in the area of motivation as it relates to learning and personality. (*Course will not be offered in 1978-79.*)
331. *Principles of Animal Behavior*. I. 4 hr. PR: Psych. 231 or equiv. Concepts in ethology and the principles governing interactions between animals. A comparative approach to animal behavior. (Also listed as Biol. 331.)
332. *Physiological Mechanisms of Animal Behavior*. II. 3 hr. PR: Psych. 231 or 232 or equiv. Explores the way behavior is controlled in a wide variety of animals so that communalities and varieties of neural and endocrine mechanisms may be better understood. (Also listed as Biol. 332.)
338. *Seminar in Animal Behavior*. I or II. 2 hr. per sem. PR: Consent. Current research and problems in animal behavior. (Equiv. to Biol. 338.)
340. *Advanced Developmental Psychology*. I or II. 3 hr. PR: Psych. 141, 314, or equiv. and consent. Research methods and substantive findings in the psychology of human development from birth to death, emphasizing developmental processes over the entire life-span.
347. *Comparative Psychology*. I or II. 3 hr. PR: Biol. 266, Psych. 121 or 122. Comparison of the structure of representative animals of the various phyla in relation to differences in behavior. (*Course will not be offered in 1978-79.*)
351. *Advanced Social Psychology*. I or II. 3 hr. PR: Psych. 151 and consent. Consideration of contemporary theory and practice in social psychology.
355. *Behavior Science and Health Care*. II. 3 hr. PR: Consent. Principles of behavior science applied to issues in physical and mental health care. Topics include the study of interpersonal roles and games, various cultural "healing" practices, personal and social aspects of illness, family disorganization, and hospitals and related institutions. (Equiv. to Behav. Med. and Psychiatry 355.)
363. *Personality Theory and Research*. I or II. 3 hr. PR: Psych. 263, 314, or equiv. Intensive analysis of current research and theory in the psychology of personality.
379. *Professional Problems in the Practice of Psychology*. I or II. 2 hr. PR: Consent. Current problems in the practice of clinical psychology.
381. *Behavior Pathology*. I or II. 3 hr. PR: Psych. 263, 281, consent. Advanced study of etiology and dynamics of severe behavior pathology.
397. *Master's Thesis*. I and II. 1-6 hr. PR: Consent.
409. *Seminar: Industrial*. I or II. 2 hr. PR: Consent. Current research and problems in industrial psychology. (*Course will not be offered in 1978-79.*)
416. *Factor Analysis*. I or II. 3 hr. PR: Psych. 315, consent. Alternate methods for factor extraction, communalities, rotation in orthogonal and oblique space, and estimation of factor scores. (Equiv. to Stat. 446.)
418. *Theory Construction*. I or II. 3 hr. PR: Consent. Methods of theory construction and role of theory in selected psychology areas.

419. *Seminar: Methodology.* I or II. 2 hr. per sem. PR: Consent. Current problems in statistics and research or instructional methods.
423. *Human Learning.* I or II. 3 hr. PR: Psych. 122 or equiv. Historical and contemporary review of research and theory in verbal learning, transfer, mediation, retention and memory processes, including motor skill learning and verbal conditioning.
429. *Seminar: Learning.* I or II. 2 hr. per sem. PR: Consent. Current research and problems in the psychology of learning.
431. *Advanced Physiological Psychology.* I or II. 2 hr. PR: Psych. 331. Neuroanatomical and neurophysiological correlates of complex behavior.
432. *Physiological Psychology Laboratory.* I or II. 2 hr. PR: Psych. 331, consent. Research techniques used in exploring the neural basis of behavior.
439. *Seminar: Physiological.* I or II. 2 hr. per sem. PR: Consent. Current research and problems in physiological psychology.
441. *Developmental Psychophysiology.* I or II. 3 hr. PR: Psych. 331, 340, consent. Current research and problems of developmental relationship between physiological response systems and processes through the human life-span.
442. *Developmental Cognition and Language.* I or II. 3 hr. PR: Psych. 340, consent. Cognitive change, language acquisition and use throughout the human life-span. Interplay of language with conceptual organization and mediating processes.
444. *Socialization.* I or II. 3 hr. PR: Psych. 340, consent. The current state on theory and research in the field of life-span socialization with emphasis on consideration of age-related changes in agents, mechanisms, goals and products inherent in organism-environment interaction.
446. *Development Perception.* I or II. 3 hr. PR: Psych. 340, consent. Preview of research investigating relationship between maturational and perceptual processes through life-span. Development of attention, perceptual organization, mechanisms of perceptual development, and influence of age on sensory processing. (*Course will not be offered in 1978-79.*)
447. *Developmental Learning Processes.* I or II. 3 hr. PR: Psych. 340, consent. Review of research and theory related to interaction of learning and maturational processes in children, retardates and adults. Concept formation, discrimination learning, learning set, conditioning, verbal and language behavior.
448. *Advanced Personality Development.* I. 3 hr. PR: Psych. 340, consent. Review and examination of current research and theory in personality development through human life-span.
449. *Seminar: Developmental.* I or II. 2 hr. per sem. PR: Consent. Current research and problems in developmental psychology. (*Course will not be offered in 1978-79.*)
452. *Group Dynamics.* I or II. 3 hr. PR: Psych. 151 or equiv., consent. Psychological and sociological approaches to dynamics of group processes. Leadership, informal communication and group processes, relations of group aims to group organization, and effects of group on personality.
459. *Seminar: Social.* I or II. 2 hr. per sem. PR: Consent. Research and problems in social psychology.

469. *Seminar: Personality and Abilities.* I or II. 2 hr. per sem. Research and problems in areas of personality and trait measurement.
- NOTE: All courses in 470 series are professional skills courses open only to degree candidates in psychology except by special department permission.*
470. *Objective Methods of Personality Assessment.* I. 3 hr. PR: Consent. Observation, science and psychological assessment; development of psychological tests; behavioral rating scales, and assessment; interview as assessment instrument.
471. *Clinical Assessment Methods.* II. 3 hr. PR: Psych. 470, consent. Intelligence testing, performance and non-language tests, assessment of central nervous system impairment, and assessment of child and geriatric patients.
473. *Advanced Personality Assessment.* I or II. 3 hr. PR: Psych. 471, consent. Supervised practice in diagnostic application of personality assessment techniques. Includes clerkship in various mental health facilities.
- 474, 475. *Behavior Modification.* I, II. 3 hr. per sem. PR: Psych. 322, consent. Theory and practice of behavior modification based on learning theory and dynamic personality theory problems.
476. *Group Methods of Behavior Modification.* I or II. 3 hr. PR: Consent. Principles of group dynamics, personality, and learning theory to use of group processes for modification of abnormal behavior patterns.
477. *Clinical Psychology Practicum.* I and II. 1-6 hr. per sem. PR: Consent. Supervised practice of psychological techniques in clinics or institutional settings. Experience in psychological testing, interviewing, report writing, case presentation, interpretation of tests and supportive counseling. (Primarily for students in master's program in clinical psychology.)
478. *Advanced Clinical Practicum.* I and II. 1-6 hr. per sem. PR: Consent.
479. *Seminar: Clinical.* I or II. 2 hr. per sem. PR: Consent. Research and problems in clinical psychology.
485. *Seminar in Community Psychology.* I or II. 2 hr. per sem. PR: Consent. Research and problems in community psychology.
489. *Seminar: Abnormal.* I or II. 2 hr. per sem. PR: Consent. Research and problems in abnormal psychology.
490. *Teaching Practicum.* I and II. 1-3 hr. per sem. PR: Consent. Supervised practice in college teaching of psychology.
497. *Research.* I and II. 1-15 hr. per sem. PR: Consent.

PUBLIC ADMINISTRATION PROGRAM

The Public Administration Program offers a public administration curriculum for graduate students seeking the Master of Public Administration degree or a specialization in the field as part of another graduate degree program. This program provides a professional orientation to the primary facets of public management.

Master of Public Administration Degree

The Master of Public Administration curriculum serves the needs of students from a variety of backgrounds who wish to pursue careers in public service. The program directs particular attention to developing an understanding of the management function in the public context as well as preparation in utilizing advanced management techniques. The study program furnishes the student with opportunities to attain comprehensive understanding of governmental policy-making and policy execution. The processes of administration are reviewed in terms of their relationship with, and applicability to, the functioning of government at all levels.

The program is designed to supply an academic foundation for comprehension of the range of processes and management approaches employed in public administration. These include program planning, personnel administration, budgetary policy-making and policy execution, systems approaches, organizational dynamics, practically oriented research, and leadership. Particular stress is placed on those functions and issues that require the greatest degree of adaptation, innovation, and responsiveness on the part of the professional administrator.

The curriculum of the program reflects the diversity of skills required by all levels of government. The range of needs is broad in scope; students apply from diverse backgrounds, including political science, other social sciences, physical sciences, humanities, and from positions in public service.

Curriculum: The M.P.A. degree requires the completion of 47 credit hours. This includes:

1. Public administration courses in core areas such as administrative organization and management, public personnel management, public budget formulation and execution, applied research, and operations research (Ind. Eng'g. 359),
2. Two semesters of colloquium (guest speakers and special presentations),
3. Field experience, and
4. Selections from a wide range of specialized public administration courses and elective courses offered in other fields.

Most students take 20 hours of required courses and colloquium, 3-9 hours field experience, and 18-24 hours from the specialized public administration and elective courses (depending on the type of field experience and the amount of credit). These general requirements can be tailored to individual student needs with revisions agreed upon by both the student and adviser.

It will usually take the equivalent of one calendar year for full-time students to complete on-campus requirements. In addition, off-campus field experience will generally be one semester in length and may be taken after part or all course work is completed. For those individuals who have been in full-time public service positions, projects relating directly to that work experience can be designed for field experience credit.

Tool Requirement: Candidates for the degree must demonstrate basic competence in accounting, statistics, or computer science. This requirement may be satisfied by the successful completion of course work at an accredited institution or by passing an examination. The tool requirement need not be completed before entrance into the M.P.A. program, but students are advised to take courses in all three tool areas as part of their undergraduate programs. Tool courses taken at the graduate level (200 and above) may be counted as elective hours toward the degree requirements. Undergraduate tool courses may be taken P/F (pass/fail).

Admission Requirements: Candidates must meet the admission requirements of the Graduate School for graduation from an accredited college and grade-point average. Admissions into the M.P.A. program is competitive with decisions based on:

1. Application for Admission to the Graduate School and transcripts (submitted to the Director of Admissions).
2. Three letters of evaluation (forms are available from Director of the Public Administration Program), Graduate Record Examination scores (both the aptitude test and an advanced test), a vita, any other information that would be supportive, and interviews, where possible. (These materials should be submitted to the Director of the Public Administration Program.)

In the case of practicing administrators, a record of accomplishment in administrative performance will be weighed heavily in combination with the criteria outlined above.

Students applying for First Semester or Summer admission should have all application materials submitted no later than *March 15*. Notification on admission status will take place around April 1. Students applying for the Second Semester should have all application materials completed by *October 15*; notification is given around November 1.

Application forms and information may be obtained by contacting the Director of the Public Administration Program.

Financial Assistance: Application forms for financial assistance are available from the Director of the Public Administration Program. Graduate assistantships are awarded as well as fellowships and other sources of support as available.

Public Administration

Pub. Adm.

341. *Administrative Organization and Management.* I, II. 3 hr. PR: Pol. Sci. 140 or consent. Governmental administrative organization and reorganization and of such management functions as leadership, planning, coordination, public relations, and management improvement.
343. *Public Personnel Administration.* I, II. 3 hr. PR: Pol. Sci. 140 or consent. Public personnel administration with particular attention to the merit system concept, career staffing, classification and salary administration, selection, manpower utilization, training, the rights and duties of employees, and the relationship between management and personnel specialists. Emphasis on psychological and human relations aspects of the work situation with attention to role and status, motivation, leadership, employee relations, and supervisor-subordinate interaction.
345. *Public Administration and Policy Development.* I. 3 hr. PR: Pol. Sci. 140 or consent. Policy development examined in terms of the political process, specific policy cases, alternative "futures" analyses and policy science.
403. *Internship.* I, II. 3-9 hr. per sem.; students may enroll more than once. PR: Consent. A work internship in government or political agencies designed to give students actual experience in a particular field of political science or public administration.
439. *Administrative Justice.* I. 3 hr. PR: Pol. Sci. 140 or consent. Analysis of adjudicative machinery and concepts of justice in American public administration. The focus is upon conflict between systems of individual and social justice, and the control of administrative discretion in the service of democratic ideals and equity.

- 440, 441. *Directed Reading and Research in Public Administration*. I, II. 2-4 hr. per sem.; students may enroll more than once. PR: Pol. Sci. 140 or consent.
442. *American Administrative Systems and Processes*. I. 3 hr. PR: Pol. Sci. 140 or consent. Analysis of the nature and processes of American public administration (political, legal, economic, and social conditions) followed by a survey of organization, planning, budgeting, and personnel as the basic elements of an administrative system.
444. *Public Program Planning*. II. 3 hr. PR: Pol. Sci. 140 or consent. A study of the design and management of governmental administrative systems. Special attention is given to systems theory, methods of system analysis, communications, management controls and methods of program evaluation.
445. *Public Budget Formulation and Execution*. I, II. 3 hr. PR: Pol. Sci. 140 or consent. The budget as a focus of policy formulation and an instrument of controlling the work program. The process of budget creation and administration. The form of the budget. Budgetary practice in American governments.
446. *Public Program Seminar*. S. 6 hr. PR: Advanced standing in the MPA Program. An analysis through case studies of the application of administrative processes to a major public problem. Students in the course are expected to produce substantial research papers on selected public problems.
447. *Applied Research in Public Administration*. I, II. 6 hr. PR: Consent. The scientific method applied to public management and public organizational behavior; formulating and testing hypotheses applicable to applied public policy questions; techniques for collecting data; problems and measurement of social variables; interpreting research results.
448. *Legal Environment of Public Administration*. I, II. 3 hr. PR: Consent. This course (1) explores the constitutional-legal basis of public administration in the United States; (2) acquaints the student with the legal profession, legal materials, and legal reasoning; (3) provides training in legal research, case preparation and advocacy; (4) conveys knowledge of administrative law and processes; and (5) provides information on the legal and ethical responsibilities of government administrators as individuals.
449. *Seminar in Public Administration*. II. 3 hr. PR: Consent.
491. *Advanced Study*. I, II. 3 hr. PR: Pol. Sci. 140 or consent. The focus of this course will be depending on those subjects of most topical concern in public administration.
492. *Administrative Behavior in Public Organizations*. I, II. 3 hr. PR: Consent. This course introduces and familiarizes the student with the nature of individual and group behavior in public bureaucratic settings.
499. *Colloquium*. I, II. 1 hr. Enrollment is limited to students participating in the M.P.A. Program.

RELIGIOUS STUDIES

290. *Seminar: Selected Topic*. I or II. 3 hr. PR: A previous Religious Studies course or consent.
291. *Seminar: Selected Topic*. I or II. 3 hr. PR: A previous Religious Studies course or consent. (*Course will not be offered in 1978-79.*)

SOCIOLOGY AND ANTHROPOLOGY

The Department of Sociology and Anthropology offers a program of study leading to the Master of Arts degree in Sociology. This degree is appropriate for: (1) students interested primarily in academic careers who plan to continue advanced graduate work at other universities; (2) students preparing to do applied research including program administration or evaluation for local or state agencies, organizations, or groups.

Admission. Applicants for admission to graduate study must have a bachelor's degree from an accredited institution. Students who do not have adequate social science backgrounds may be required to take remedial work. Applicants are required to submit transcripts from their undergraduate institutions and three letters of recommendation. Applicants are required to submit aptitude scores from the Graduate Record Examination; the advanced test score is also recommended. Foreign students for whom English is not the native language are required by the University to submit "Test of English As a Foreign Language" (TOEFL) scores and may be required to participate in the University's Language Orientation Sessions.

Applications should be completed by April 15 for admission to the First Semester (March 15 if an assistantship is sought), and by September 15 for admission to the Second Semester. Full-time students who are admitted "Special Provisional" will be required to complete 12 hours of approved course work with a B average or better within the year. Students who fail to do so will be suspended. Each student is assessed in the Spring by the Departmental Graduate Committee regarding his/her continuation in the program with or without support.

Assistantships. Assistantships are awarded competitively, and include a stipend and tuition exemption. Both teaching and research assistantships are usually available, the latter for students with demonstrated research skills. Support is available for a maximum of two years. Applications and assistantships forms may be obtained by writing to the Department Chairman.

Degree Requirements. Students may select one of two options leading to the M.A. (In either program at least 60 percent of the total number of required hours must be taken in courses numbered at the 300-level; the remainder may be at the 200-level.)

1. *Thesis Option* — Thirty hours of course work and a thesis which meets the requirements of the Graduate School. This option is appropriate for students interested in continuing toward the doctorate or who are interested in a theoretical question. Students electing this option will take the following courses:

- Contemporary Sociological Theory
- Survey Methods
- Qualitative Methods
- Elementary Data Analysis
- Social Systems and Social Policy Seminar (First Semester)
- Thesis (6 hours)
- Electives (15 hours)

2. *Applied Social Research Option* — Thirty-six hours of course work and an Independent Evaluation Report based on the study of a public service institution, community service program, or community group. The objectives of this option are to provide: (1) substantial grounding in basic research skills; (2) an overview of the relationship between social research and social polity; and (3) specialized

knowledge in at least one field of social service. The option is especially designed for students wishing to pursue a career in planning, administration and/or evaluation of social services, but is also appropriate for those planning to pursue further academic work. In addition to a core of research skills, students will select an applied area of social service. Applied areas include Aging and Gerontology, Community Development, Complex Organization, Demography, Education, Family Services, and Health Care Delivery. Applied area courses may be taken within the department or in other units of the University. Students will take at least three courses in the same applied area.

Program in Applied Social Research

First Semester

Social Systems and Social Policy Seminar
Survey Methods
Applied Area Course
Applied Area Course

Third Semester

Comparison of Research Methods
Advanced Data Analysis
Applied Area Course
Applied Area Course

Second Semester

Social Systems and Social Policy Seminar
Qualitative Analysis
Elementary Data Analysis
Applied Area Course

Fourth Semester

Independent Evaluation Research
(6 hours)

The Department of Sociology and Anthropology, in cooperation with the WVU Office of Publications, publishes the Rural Sociological Society's *Monograph Series*. For the period 1976-79, the editorial offices for *Human Organization: Journal for the Society of Applied Anthropology* are housed in the department.

Sociology and Anthropology

S.A.

201. *Sociological Theory*. I, II. 3 hr. PR: 6 hr. S.A. and senior standing or consent. Systematic analysis of major sociological theories viewed from historical perspective and in terms of current research.
203. *Collective Behavior*. I or II. 3 hr. PR: 6 hr. S.A. or consent. Analysis of riots, demonstrations, crowd and mob behavior, and other forms of social contagion, and a study of behaviors following natural disasters and social unrest.
204. *Complex Organizations*. I or II. 3 hr. PR: 6 hr. S.A. or consent. The structure and functioning of large-scale bureaucratic organizations, including studies of industrial organizations, prisons, hospitals, government bureaus, and the military in contemporary society.
205. *Class, Status and Power*. I or II. 3 hr. PR: 6 hr. S.A. or consent. Analysis of various systems of social inequality. Emphasis on empirical studies describing social class system, distribution of status and power, and patterns of social mobility in America.
211. *Social Research Methods*. I, II. 3 hr. PR: S.A. 1, 5 or 7 or consent. Logic of social research, elements of research design, and problems of measurement, with emphasis on survey research methodology and data analysis.

222. *Community Development*. II. 3 hr. PR: S.A. 122, 131, 233, or consent. Application of sociological knowledge of structure of communities for planning programs and services. Emphasis on techniques of organizing efforts for community change.
223. *Sociology of Rural Life*. I or II. 3 hr. PR: S.A. 1 or consent. Social aspects of rural living. Characteristics of rural population, social structure, and institutional arrangements: family, community, education, religion, recreation, health, welfare, and local government.
231. *Society and Health*. I. 3 hr. PR: 6 hr. S.A. or consent. Health and illness behavior and the social organization of the health professions, including the problems of health-care delivery systems in the United States and in developing areas.
232. *Sociology of Education*. (Same as Ed. Found. 300.) I or II. 3 hr. PR: S.A. 1 or consent. Education as a social institution, cultural and class influences on education, social roles and career patterns in the school system, the school and problems of the community.
233. *Industrial Sociology*. I or II. 3 hr. PR: S.A. 1 or consent. Cross-cultural studies of work and of the structure and functioning of industrial organizations.
240. *Social Change*. I or II. 3 hr. PR: 6 hr. S.A. or consent. Sociological analysis of current major changes in our society, of the forces underlying them, and of tensions to which they give rise. Alternative future directions; rational manipulation and planning for social change.
241. *Population Dynamics*. I or II. 3 hr. PR: 6 hr. S.A. or consent. Demographic analysis focusing on social causes and consequences of variations in fertility, morbidity, mortality, and migration. National and state population policies also considered.
245. *Soviet Society*. I or II. 3 hr. PR: 6 hr. S.A. or consent. Social and cultural trends in contemporary Soviet Union. Population characteristics and ethnic and nationality diversity; the family, education, political institutions and social classes; agricultural, industrial, and scientific organization. Comparisons with U.S. society.
251. *Cultural Dynamics*. I or II. 3 hr. PR: 6 hr. S.A. or consent. Nature of culture and how it changes, including natural environmental changes, culture-contact, economic and population pressures.
252. *Culture and Personality*. I or II. 3 hr. PR: 6 hr. S.A. or consent. How different cultures shape the personalities of their members; concepts such as model personality and national character. (*Course will not be offered in 1978-79.*)
254. *Anthropological Perspectives on Aging*. I or II. 3 hr. PR: 6 hr. S.A. or consent. An examination of how social systems —technologically primitive as well as industrially developed — are arranged to accommodate the needs of old people. The course also considers individual aging processes, and demographic and social consequences of increased longevity.
255. *Anthropological Theory*. I. 3 hr. PR: 6 hr. S.A. or consent. Theoretical contributions of anthropology to the social sciences. Key figures of modern anthropology, i.e., Boas, Malinowski, and Mead.
256. *Field Methods*. II. 3 hr. PR: S.A. 211 and Stat. 101 or consent. The distinctive craft of data gathering in cultural anthropology. Development skills in field methods and participant observation.
257. *Primate Behavior*. (Same as Biology 235). I or II. 3 hr. PR: 3 hr. of any behavioral science or consent. Primates as they exist in their natural habitats suggest clues to

early human behavior and evolution of behavior. Case studies and comparative behavior from prosimians, monkeys, and apes to human hunters and gatherers.

260. *Society and Personality*. I or II. 3 hr. PR: 6 hr. S.A. or consent. Interaction between society and the individual's behavior. Key concepts are social role, and the social self. Focus on adult experiences and adult socialization.
261. *Criminal Justice in America*. I or II. 3 hr. PR: 6 hr. S.A. or consent. America's criminal justice system within an interest group perspective. Police corruption and brutality, due process and individual rights, victimless crime, bail, jail reform, and abolition of prisons.
290. *Special Topics*. I, II, S. 3 hr. PR: 6 hr. S.A. or consent. Courses on issues and problems of current concern. Topics change, so students may enroll more than once.
291. *Honors Seminar*. I, II. 3 hr. PR: Honors standing in sociology. A seminar on a topic of importance in sociology and anthropology. (*Course will not be offered in 1978-79.*)
293. *Independent Study*. I, II, S. 1-3 hr. per sem. PR: 3.0 grade-point average and written departmental permission. Directed reading or research for students desiring work not available in regular course offerings.
322. *Contemporary Sociological Theory*. I or II. 3 hr. PR: 9 hr. S.A. or consent. Review of recent trends and orientations in sociology. Theory construction, typologies, mathematical models and the relationship between theory and research. Review of current literature.
331. *Methods of Social Research*. I or II. 3 hr. PR: Stat. 101, 311, or equiv. The research process from conceptualization of the problem to analysis of the data. Sampling, questionnaire construction, measurement, and computer skills in analysis of data.
372. *Sociocultural Factors in Health, Illness, and Medical Care*. II. 3 hr. PR: 9 hr. S.A. or consent. Distribution of disease in the population and patterns of illness behavior. Sociological study of the health professions, community health care institutions, and the cost and organization of health services.
390. *Special Topics*. I, II, S. 3 hr. A graduate course offered as the need arises. Topics change so students may enroll more than once.
391. *Seminar*. I, II. 3-9 hr.
393. *Independent Study*. I, II, S. 2-9 hr. PR: Written departmental consent. Directed reading and/or research in a specialized area of interest.
394. *Thesis*. I, II, S. 1-9 hr.
490. *Teaching Practicum*. I, II, S. 1-6 hr.
497. *Research*. I, II, S. 1-15 hr.

SPEECH COMMUNICATION

Master of Arts

The Department of Speech Communication offers work leading to the Master of Arts degree in communication theory and research. Persons who possess a bachelor's degree from an accredited college or university may be admitted to the

program. Qualified graduate students from a variety of disciplines are admitted to the program. The Master of Arts degree is intended to qualify the student to:

1. Assume a variety of professional roles in educational, industrial, governmental, or media institutions.
2. Teach the subject matter in high school and/or college.
3. Undertake advanced training toward a doctorate in the behavioral sciences.

In addition to the general requirements of the Graduate School, the graduate student in speech communication must meet the following departmental requirements:

1. Successful completion of the minimum number of required graduate hours as set forth in Program A, B, or C below.
 2. Maintain a minimum grade-point average of 3.0.
- Applicants for admission must specify the program they wish to pursue.

Program A — Thesis Program

All students planning to continue graduate study past the M.A. level are encouraged to enter this program. The following is required:

1. At least 36 hours of graduate credit, 30 of which must be in the Department of Speech Communication. A maximum of 6 hours of thesis credit will be allowed.
2. Completion of Sp. Com. 401 and 420.
3. A thesis.
4. An oral examination on the thesis.

Program B — Non-Thesis Program

All students planning a professional career in a field other than education are encouraged to enter this program. This is normally a terminal degree program in speech communication.

1. A minimum of 36 hours of course work with at least 30 in the Department of Speech Communication.
2. Completion of Sp. Com. 401 and 420.
3. Successful completion of written and oral comprehensive examinations: (a) Comprehensive examinations draw upon broad course concepts as applied to theoretical and practical problems in communication; (b) The content and form of the comprehensive examinations are tailored for the individual student by the student's advisory committee.

Program C — Non-Thesis Program

All students planning a professional career in elementary or secondary education are encouraged to enter this program. This is a terminal degree program in speech communication.

1. A minimum of 36 hours of course work with at least 18 hours in the Department of Speech Communication and at least 12 hours in the College of Human Resources and Education.
2. Completion of a seminar on communication in the classroom.
3. Completion of a course/seminar with principal emphasis on learning theory. (Ed. Psych. 300 or 450 are recommended.)
4. Successful completion of written and oral comprehensive examinations: (a) Comprehensive examinations draw upon broad course concepts as applied to

theoretical and practical problems of communication in elementary and secondary education; (b) The content and form of the comprehensive examinations are tailored for the individual student by the student's advisory committee.

Speech Communication

Sp. Com.

201. *Principles of Communication Education*. I, II, S. 3 hr. PR: 15 hr. speech communication. Literature, principles, and current practices of communication education in public schools with directed application. Intended for teachers in communication and language arts.
221. *Persuasion*. I, II, S. 3 hr. PR: Sp. Com. 11. Theory and research in persuasion, emphasizing a critical understanding and working knowledge of the effects of social communication on attitudes, beliefs, and behavior.
275. *Communication Problems of Children*. I, II. 3 hr. PR: Sp. Com. 11. Primarily for elementary and secondary school teachers and language arts supervisors. Normal maturational development of listening and speaking skills, their relationships to language acquisition, and influence upon achievement.
281. *Media in Communication and Education*. I, II. 3 hr. Use of the media in educational and other communication environments with emphasis on communication processes and principles relevant to television and film.
361. *Communication in the Classroom*. I, II, S. 3 hr. PR: Teaching experience or consent. Role of interpersonal communication in classroom environment, with particular emphasis on communication between students and teachers. Recommended for elementary, secondary, and college teachers in all fields.
362. *Nonverbal Communication in the Classroom*. I, II, S. 3 hr. PR: Sp. Com. 361. Impact of nonverbal communication behaviors of students and teachers on teacher-student interaction and student learning. Recommended for elementary, secondary, and college teachers in all fields.
363. *Communication in the Educational Organization*. I, II, S. 3 hr. PR: Sp. Com. 361. Problems of communication within educational organizations with emphasis on elements that impact educational change, conflict management, and interpersonal influence. Recommended for elementary, secondary, and college teachers in all fields.
370. *Theory and Research in Interpersonal Communication*. II. 3 hr. PR: Consent. Modern psychological principles of speech learning and usage. Influences of emotion, conditioning, and habit formation on listening, thinking, language, and personality factors in oral communication.
371. *Theory and Research in Language*. I, II, S. 3 hr. Syntactics, semantics, and pragmatics of language behavior. Analyses of contemporary linguistic theories.
372. *Theory and Research in Mass Communication*. I, II, S. 3 hr. Mass communication from a consumer's viewpoint. Use of consumer-oriented mass media research also stressed.
373. *Theory and Research in Persuasion*. I, II, S. 3 hr. Various theories and principles of persuasion with emphasis on contemporary research literature.
374. *Theory and Research in Diffusion and Social Change*. I, II, S. 3 hr. Advanced seminar in communication and change in various cultures. Special emphasis on research in diffusion of innovations.

376. *Theory and Research in Organizational Communication*. I, II, S. 3 hr. Contemporary research linking communication variables and networks to organizational change, effectiveness, leadership, power, and management practices. Analysis of communication problems within a variety of organizations.
377. *Small Group Theory and Practice*. I, II, S. 3 hr. Specific research areas in interpersonal communication with intensive emphasis on small groups.
401. *Introduction to Graduate Study in Human Communication*. I, S. 3 hr. Major emphasis on designing and conducting experimental and laboratory research in human communication. Computer applications to social science research also given consideration. Should be taken first semester of graduate study.
402. *Advanced Seminar in Research Methods*. II, S. 3 hr. PR: Sp. Com. 401. Research techniques necessary to conduct original communication research. Emphasis on advanced statistical techniques.
420. *Survey of Human Communication Theory*. I, II, S. 3 hr. Broad overview of contemporary theories in human communication. Should be taken first semester of graduate study.
433. *Special Topics*. I, II, S. 3-12 hr. PR: Consent. Thorough study of special topics in human communication including interpersonal and small group, language, intercultural, organizational, persuasion, and mass communication, nonverbal communication, and communication education.
475. *Independent Study*. I, II, S. 1-3 hr. PR: Consent. Open to graduate students pursuing independent study in communication.
491. *Advanced Study*. I, II, S. 3 hr. Advanced study in a variety of areas in human communication.
496. *Seminar in Human Communication*. I, II, S. 3-9 hr. Current problems and research in human communication.
497. *Research*. I, II, S. 1-15 hr.
499. *Thesis*. I, II, S. 3-6 hr.

STATISTICS AND COMPUTER SCIENCE

The Department of Statistics and Computer Science offers a Master of Science degree with a major in Statistics and a Master of Science degree with a major in Computer Science. The Master of Science degree is intended to qualify the student to: (1) Assume a professional role in an educational, industrial, or government research project; (2) Teach in a junior or senior college, or (3) Undertake advanced training toward a doctorate in one of the quantitative fields of science.

Each degree program has two options: a Thesis Option, which requires 30 hours of course work including 6 hours of credit for a thesis, and a Problem Report Option, which requires 36 hours of course work including 3 hours of credit for a problem report. Because many students receive baccalaureate degrees from colleges which do not offer undergraduate programs in either statistics or computer science, they may lack certain prerequisite courses. Those lacking prerequisite courses may find it necessary to take course work in addition to the required credit hours; such additional work may include lower-division courses for which graduate credit cannot be given.

Students are encouraged to request a written examination over foundation material during the first three weeks of the semester in which they hope to graduate. All written examinations will be given during the last month of the semester in which they are requested. The final oral examination, for those students passing a written examination over foundation material, will have less emphasis on course work. Courses that contain foundation material are listed under each program.

More information concerning graduate studies may be found in "Graduate Programs in Statistics and Computer Science" available from the Department.

Statistics

Two options are available for students seeking a Master of Science degree in Statistics. The two options are:

1. *Problem Report Option*: At least 36 hours of course work including 3 hours of credit for a problem report.

2. *Thesis Option*: At least 30 hours of course work including 6 hours of credit for a thesis.

Students are expected to know the material contained in the following courses upon admission to the program. Otherwise, these deficiencies must be removed as early as possible in the student's degree program.

1. Single and Multivariable Calculus (Math. 15, 16, 51 or equiv.)

2. Math. 241 or Stat. 223 or equiv.

Minimum required courses for either option are:

1. Stat. 361, 362, 496.

2. Fifteen hours from Stat. 312 (or 312A, B, C), 313, 341, 351, 371, 381.

3. One course from Stat. 441, 451.

4. One course from Stat. 490, 492.

Credit towards the degree requirements will not be given for Stat. 311 (Stat. 311A, B, E.)

All students must pass a final oral examination over the problem report of thesis and course work. Foundation material for the oral and/or written examination(s) is contained in Stat. 312, 313, 341, 351, 361, 362, 371, and 381.

Statistics

Stat.

212. *Intermediate Statistical Methods*. I, II. 3 hr. PR: Stat. 101. Extension of basic concepts of statistical inference: estimation and hypothesis testing for two populations, multiple regression and correlation, curvilinear regression, nonparametric tests, analysis of variance and covariance.

213. *Introductory Design and Analysis*. I. 3 hr. PR: Stat. 212. Introduction to the linear model, the complete and fractional factorial experiment, and the completely random, randomized complete block, Latin square, and split plot experimental designs.

221. *Statistical Computer Techniques*. I. (Alternate Years.) 3 hr. PR: A programming language; and Conc.: Stat. 212 or equiv. Computer generation of pseudorandom numbers and tests of randomness. Elementary computer simulations relating to estimation and tests of hypothesis. Computer algorithms for basic statistical methods.

223. *Applied Matrix Algebra*. I. 3 hr. PR: Math. 18 or 51. Elementary matrix concepts and operations, vector spaces, characteristic roots and vectors, generalized inverses,

systems of linear equations, patterned matrices, orthogonal and other special matrices. (Equiv. to C.S. 223 and Math. 223.)

231. *Sampling Methods*. I. 3 hr. PR: Introductory course in statistics. Methods of sampling from finite populations, choice of sampling unit, sample survey design, estimation of confidence limits and optimum sample size, and single and multi-stage sampling procedures.
251. *Data Analysis*. II. (Alternate Years.) 3 hr. PR: Stat. 213. Computer analyses of simulated or real unbalanced data using a matrix approach to linear models. The techniques will include least squares analysis of variance and covariance, multiple and polynomial regression, and multiple discrimination.
261. *Statistics and Probability 1*. I. 3 hr. PR: Math. 16. Events, random variables, discrete and continuous probability distributions. Expected value, moment generating functions, special probability distributions. Sampling including random samples and distributions of certain functions of random variables. The Central Limit Theorem.
262. *Statistics and Probability 2*. II. 3 hr. PR: Stat. 261. An introduction to statistical inference. Properties of estimators and techniques of estimation. Hypotheses testing including the Neyman-Pearson lemma and likelihood ratio tests. Regression and correlation including least squares. Selected topics.
291. *Special Topics*. I, II, S. 1-6 hr. Advanced study of special topics in statistics.
311. *Statistical Methods 1*. I, II. 3 hr. PR: Math. 3. Statistical models, distributions, probability, random variables, tests of hypotheses, confidence intervals, regression, correlation, transformations, F and Chi-square distributions, analysis of variance and multiple comparisons. (Equiv. to Ed. Psych. 311, Psych. 311, and Stat. 311A, B, E.)
- 311A. *Introductory Probability and Hypothesis Testing*. S. 1 hr. Basic laws of probability, binomial distribution, normal distribution, and testing hypotheses about parameters of these distributions.
- 311B. *Normal Distribution Tests of Hypotheses*. S. 1 hr. PR: Stat. 101 or 311A or equiv. Chi-square and F-tests for hypotheses concerning variances, t-test and f-test for hypotheses concerning means.
- 311C. *Nonparametric Methods for Nominal Data*. S. 1 hr. PR: Stat. 311 or 311A or equiv. Levels of measurement, tests of normality, one-, two-, and k-sample tests for nominal data.
- 311D. *Nonparametric Methods for Ordinal Data*. S. 1 hr. PR: Stat. 311 or 311A. Test for skewness, kurtosis, and shifts in locations. One-, two-, and k-sample tests for ordinal data.
- 311E. *Regression, Correlation, and Contingency Analysis*. S. 1 hr. PR: Stat. 311B or equiv. Simple linear regression and correlation analysis. Contingency analysis including chi-square tests and measures of association.
- 311F. *Principles of Sampling*. S. 1 hr. PR: Stat. 311A or equiv. Design of questionnaires, methods of data collection, and common sample survey designs.
- 311G. *Sampling in Specific Fields*. S. 1 hr. PR: Stat. 311F. Application of principles of sampling to several specific fields. Areas of application determined by interests of the student.

- 311H. *Exploratory Data Analysis*. S. 1 hr. PR: Stat. 311A or equiv. Visual and graphical techniques by which interesting, fundamental characteristics of data structure can be explored and analyzed. Easy summaries and re-expressions plots of relationships, effective comparisons, and smoothing sequences.
- 311I. *Multivariate Structure Analysis*. S. 1 hr. PR: Stat. 311E or equiv. Measures of association for binary, ordinal, interval, and ratio variables, as well as measures of distance between elements. Structuring of these relationships by cluster analysis, multidimensional scaling, and factor analysis.
312. *Statistical Methods 2*. II. 3 hr. PR: Stat. 212 or 311 or equiv. Completely random, randomized complete block, Latin square and split-plot experimental designs. Unplanned and planned multiple and orthogonal comparisons for qualitative and quantitative treatments and factorial arrangements. Multiple linear regression and covariance analysis. (Equiv. to Ed. Psych. 312, Psych. 312, and Stat. 312A, B, C.)
- 312A. *Regression Analysis*. S. 1 hr. PR: Stat. 311A or equiv. Matrix approach to simple and multiple regression analysis, finding best equation, and tests of hypothesis.
- 312B. *Introductory Analysis of Variance*. S. 1 hr. PR: Stat. 311B or equiv. Comparison of group means in the completely randomized design including multiple comparisons, orthogonal contrasts, and factorial arrangements of treatments.
- 312C. *Design and Analysis of Experiments I*. S. 1 hr. PR: Stat. 312B or equiv. Use of randomized complete block, Latin square and split-plot designs and analysis of covariance to reduce experimental error.
- 312D. *Design and Analysis of Experiments II*. S. 1 hr. PR: Stat. 312C or equiv. Power of tests, relative efficiency of basic designs, and choice of alternative designs.
- 312E. *Unequal Numbers Analysis of Variance*. S. 1 hr. PR: Stat. 312A and 312B. Unequal sub-class numbers analysis of variance, use of different restrictions, and tests of hypothesis.
313. *Design of Experiments*. II. 3 hr. PR: Stat. 312 or equiv. Expected mean squares, power of tests and relative efficiency for various experimental designs. Fixed, random, and mixed models. Use of sub-sampling, covariance and confounding to increase power and efficiency.
341. *Applied Multivariate Analysis*. I. 3 hr. PR: Stat. 212 or 311 or equiv. Introduction to Euclidean geometry and matrix algebra, multiple and multivariate regression including multiple and canonical correlation, the k-sample problem including discriminant and canonical analysis, and structuring data by factor analysis, cluster analysis, and multidimensional scaling.
351. *Applied Regression Analysis*. I. 3 hr. PR: Stat. 312. Matrix approach to linear and multiple regression, selecting the "best" regression equation, model building, and linear models approach to analysis of variance and analysis of covariance.
361. *Theory of Statistics 1*. I. 3 hr. PR: Math. 51. Probability and random variables, univariate and multivariate distributions, expectations, generating functions, marginal and conditional distributions, independence, correlation, functions of random variables including order statistics, limiting distributions, and stochastic convergence.
362. *Theory of Statistics 2*. II. 3 hr. PR: Stat. 361. Techniques of point and interval estimation, properties of estimates including bias, consistency, efficiency and sufficiency; hypothesis testing including likelihood ratio tests and Neyman-Pearson Lemma; Bayesian procedures, analysis of variance and nonparametrics.

371. *Introduction to Exploratory Data Analysis*. I. (Alternate Years.) 3 hr. PR: An introductory statistics course. Basic ways in which observations given in counted and measured form are approached. Pictorial and arithmetic techniques of display and discovery. Methods employed are robust, graphical, and informal. Applications to social and natural sciences. (*Offered in Fall of odd years.*)
381. *Nonparametric Statistics*. II. 3 hr. PR: Stat. 101 or equiv., and Math. 16. Distribution-free procedures of statistical inference. Location and scale tests for homogeneity with two or more samples (related or independent); tests against general alternatives.
441. *Multivariate Statistical Theory*. I. (Alternate Years.) 3 hr. PR: Stat. 361 or consent. Euclidean vector space theory and matrix algebra, multivariate normal sampling theory, the theory of the multivariate general linear hypothesis including multivariate regression, MANOVA, and MANCOVA, and the theory of factor analysis.
451. *Linear Models*. II. (Alternate Years.) 3 hr. PR: Stat. 351, 362. Multivariate normal distribution, distribution of quadratic forms, linear models, general linear hypotheses, experimental design models, components of variance for random effects models. (*Course will not be offered in 1978-79.*)
490. *Teaching Practicum*. I, II. 1-3 hr. PR: Consent. Supervised practices in college teaching of statistics.
491. *Advanced Studies in Statistics*. I, II, S. 1-6 hr. PR: Consent. Investigation in advanced statistics subjects which are not covered in regularly scheduled courses. Study may be independent or through specially scheduled lectures.
496. *Graduate Seminar*. I, II. 1 hr. PR: Consent. It is anticipated that each graduate student will present at least one seminar to the assembled faculty and student body in statistics.
497. *Research in Statistics*. I, II, S. 1-15 hr. PR: Consent.

Computer Science

Two options are available for students seeking a Master of Science degree in Computer Science. The two options are:

1. *Problem Report Option*: 36 hours of course work including 3 hours of credit for a problem report.

2. *Thesis Option*: 30 hours of course work including 6 hours of credit for a thesis. Students must have a B.S. degree in Computer Science or equivalent to enter this option.

Minimum required courses for either option are:

(a) Three courses from C.S. 310, 320, 330, 360, 370.

(b) Two additional 300-level Computer Science courses.

(c) Two additional 200- or 300-level courses in Statistics, Computer Science, Mathematics, Industrial Engineering, or Electrical Engineering.

All students must pass a final oral examination over the problem report or thesis and course work. Foundation material for the oral examination is contained in C.S. 310, 330, 340, and 360.

Computer Science

C.S.

220. *Numerical Analysis 1*. I. 3 hr. PR: Math. 16 and C.S. 120 or consent. Solutions of equations, interpolation and approximations. Numerical differentiation and integration. Numerical solution of initial value problems in ordinary differential equations. (Equiv. to Math. 321.)
221. *Numerical Analysis 2*. II. 3 hr. PR: Math. 241 and C.S. 220 or consent. Solutions of linear systems by direct and iterative methods. Matrix inversion, evaluation of determinants, and calculation of eigenvalues and eigenvectors of matrices. Application to boundary value problems in ordinary differential equations. (Equiv. to Math. 322.)
223. *Applied Matrix Algebra*. I. 3 hr. PR: Math. 18 or 51. Elementary matrix concepts and operations, vector spaces, characteristic roots and vectors, generalized inverses, systems of linear equations, patterned matrices, orthogonal and other special matrices. (Equiv. to Stat. 223 and Math. 223.)
230. *Programming Languages*. I. 3 hr. PR: C.S. 51. Formal definition of programming languages including specification of syntax and semantics. Structure of simple statements and algorithmic languages; list processing and string manipulation languages.
240. *Systems Programming*. I, II. 4 hr. PR: C.S. 51. Software organization for the support of computer components. Addressing techniques process and data modules, file system organization and management. Traffic control and communication with peripheral devices.
241. *Systems Programming*. II. 3 hr. PR: C.S. 240. Memory management; name management; file systems; segmentation; protection; resource allocation; pragmatic aspects in the design and analysis of operating systems.
248. *Programming Small Computers*. II. 3 hr. PR: C.S. 51. Processing of data using small laboratory digital computers.
260. *Information Analysis*. II. 3 hr. PR: C.S. 51. Information analysis and logical design of a computer system. Exercises and case studies are used to give students proficiency in information analysis techniques. Projects are assigned to provide practical experience in systems development and implementation.
270. *System Design*. I. 3 hr. PR: C.S. 51. Underlying principles of system design and techniques. A theme to be carried throughout the course is the iterative nature of the analysis and design process. Implementation and conversion problems also are considered. Practical projects are assigned to give students experience in actual situations.
291. *Special Topics*. I, II, S. 1-6 hr. PR: Consent. Advanced study of special topics in computer science.
301. *Computers in Research I*. I. 3 hr. Use of computers in research. Organization and characteristics of computers. Algorithms, machine language programming, scientific oriented language programming subprograms, program segmentation and linkage (Statistics and Computer Science majors should get approval of their graduate committee before taking this course for credit.)
- 301A. *Computer Applications*. S. 1 hr. A discussion of networks, hardware, software, computer applications, and social considerations.

- 301B. *FORTRAN IV Programming*. S. 1 hr.
- 301C. *Job Control Language*. S. 1 hr. PR: C.S. 301B or consent. Job control language required to effectively utilize WVU's computing system.
310. *Application Programming I*. I. 3 hr. PR: Programming knowledge. Mathematical and scientific programming. Topics include: random numbers, graphs, trees, network flows, sorting and searching algorithms.
311. *Application Programming 2*. II. 3 hr. PR: C.S. 310 or consent. Continuation of C.S. 310 where students work on a particular project under supervision of a faculty member and present a written and oral report on their project.
320. *Numerical Solution of Linear Equations*. 3 hr. PR: C.S. 120 or consent. Numerical solution of large systems of linear equations using direct and iterative methods. Calculation of inverses and generalized inverses of matrices. Numerical methods for the determination of eigenvalues and eigenvectors.
330. *Design of Language Processors*. II. 3 hr. PR: C.S. 230. Study of the design and construction of automatic programming language processors. Investigation of the structure of scientific and business oriented compilers, list processors, and information processing languages.
340. *Theory of Operating Systems*. I. 3 hr. PR: C.S. 241. Theoretical aspects of multiprogrammed and virtual operating systems. Topics include: concurrent processes, processor management, storage management, scheduling algorithms, and resource Protection.
341. *Computer Systems*. II. 3 hr. PR: C.S. 340 and Stat. 312, or consent. Simulation, evaluation, and measurement of computer systems. Techniques of measurement and evaluation using hardware and software monitors, methods of model validation, and creation of management reports.
360. *Design of Database Systems*. I. 3 hr. PR: C.S. 260. Design evaluation, implementation and use interface of database systems. Topics include: storage structures, data languages, security and relational, hierarchical and network implementation approaches.
370. *System Implementation*. II. 3 hr. PR: C.S. 260 and 270. Underlying principles of system implementation are covered both from a theoretical and from a practical point of view. As part of the course, each student will participate with other students in the implementation of a production system.
490. *Teaching Practicum*. I and II. 1-3 hr. PR: Consent. Supervised practices in college teaching of computer science.
491. *Advanced Studies in Computer Science*. I, II, S. 3-6 hr. PR: Consent. Investigation in advanced computer science subjects which are not covered in regularly scheduled courses. Study may be independent or through specially scheduled lectures.
496. *Graduate Seminar*. I, II. 1 hr. PR: Consent. Each graduate student will present at least one seminar to the assembled faculty and student body in computer science.
497. *Research in Computer Science*. I, II, S. 1-15 hr. PR: Consent.

Business and Economics

The College of Business and Economics offers graduate programs in business administration, economics, and industrial relations.

The program in business leads to the degree of Master of Business Administration (M.B.A.). This program is supervised by the graduate faculty in business administration and the students in business are administered by the director of graduate programs in business.

Graduate programs in economics lead to the degrees of Master of Arts (M.A.) and Doctor of Philosophy (Ph.D.). These programs are supervised by the graduate faculty in economics and the students are administered by the director of graduate programs in economics. These programs also have a number of special options conducted jointly with other units on campus. These options include Energy Economics, Industrial Relations, Manpower Planning and Evaluation, Mathematical Economics, Political Economy, and Statistics and Economics.

The program in industrial relations leads to the degree of Master of Science. This program is supervised by the graduate faculty in business and economics and the students are administered by the director of graduate programs in industrial relations.

All work for a graduate degree must be completed within a period of seven years. An extension of this period must be approved in writing by the appropriate graduate faculty and the Dean of the Graduate School.

BUSINESS ADMINISTRATION

To receive approval to enter the M.B.A. program an applicant must have a baccalaureate degree from an accredited college or university with an undergraduate grade-point average of at least 2.5 and a score of 500 on the Graduate Management Admission Test (GMAT), or a minimum GMAT score of 450 and an undergraduate grade-point average of 3.0. Applicants with a baccalaureate degree, an undergraduate grade-point average of at least 2.25 but less than 2.5, and a score of 500 on the GMAT may be approved to enter the program as a special provisional graduate student. To assure that all students in the program have the same foundation in business, the applicant must have completed the following courses or their equivalent: Principles of Accounting (two semesters); Principles of Economics; Principles of Marketing; Principles of Management (or Industrial Management); Business Finance; Principles of Statistics; and Principles of Computer Science.

A student without the necessary prerequisite courses may be approved to enter the M.B.A. program as a regular graduate student with deficiencies. Deficiencies must be removed before taking the required graduate courses. Scores on the GMAT must be submitted before an applicant can be considered for the M.B.A. program. All applications for approval to enter the M.B.A. program must be received in the WVU Office of Admissions and Records as early as possible and no later than one month before the date for which enrollment is requested.

Master of Business Administration (M.B.A.)

The candidate's program of courses will be planned with the assistance and approval of a faculty adviser. The M.B.A. degree requires 36 hours of graduate credit, including the following courses:*

Accounting 301—Managerial Control. 3 hr.
Economics 301—Managerial Economics. 3 hr.
Economics 302—Research and Reports. 3 hr.
Management 301—Administrative Practices. 3 hr.
Management 302—Quantitative Business Analysis. 3 hr.
Management 313—Production Administration. 3 hr.
Management 323—Administrative Policy. 3 hr.
Finance 313—Financial Administration. 3 hr.
Marketing 313—Marketing Administration. 3 hr.

*PR: The undergraduate courses listed above, or consent.

The candidate also will complete 9 semester hours of elective courses selected with the approval of the adviser, of which at least 3 hours must be in a graduate course of the College of Business and Economics at the 300 level, preferably in a graduate seminar in business. No thesis is required, but writing is emphasized in all courses.

The M.B.A. program requires that the student maintain a grade-point average of at least 3.0 (B) on all work taken as a graduate student while enrolled in the College, including prescribed work taken to remove undergraduate deficiencies. A student whose cumulative grade-point average falls below 2.75 will be placed on probation. If the average is not brought up to 2.75 by the end of the following semester, the student will be suspended from this program. A grade below C in any course taken while enrolled as a graduate student will result in suspension from this graduate program. In addition, the student must maintain a 3.0 (B) average in all work counting toward the graduate degree.

Complete and detailed information about the M.B.A. program may be obtained by securing a copy of the M.B.A. bulletin from the Director of Graduate Programs in Business.

ECONOMICS

The purpose of the M.A. and Ph.D. degree programs in economics is to enable students to broaden and refine their knowledge of the concepts and methods of economic analysis. These programs are designed to prepare students for careers in business, government, and higher education. Student programs will be planned with the assistance and approval of the Director of Graduate Programs in Economics. All graduate students must enroll in Economics 499, Colloquium, each semester in residence.

Admissions. To be admitted as a regular graduate student, applicants must have a grade-point average of 2.5 or better ($A=4.0$) for all undergraduate work completed. Students are required to have completed 12 hours of economics. Students are expected to have taken the general aptitude portion and Economics advanced portion of the Graduate Record Examination. It is strongly recommended that all applicants have completed at least one semester of each of the following courses: intermediate microeconomic theory, intermediate macroeconomic theory, calculus, and statistics. Applicants not meeting the entrance requirements may be admitted on a provisional basis subject to certain performance conditions during their first semester of residence.

Master of Arts (M.A.)

The M.A. degree requires a total of 36 hours of graduate credit, including 24 hours in economics. At least 24 hours of the course work completed must be at the 300 level. To qualify for the M.A. degree, graduate students in economics must earn a cumulative grade-point average of 2.75 in all courses attempted as a graduate student at WVU. The M.A. program contains a thesis and a non-thesis option. Specific course requirements include:

Core Courses—

Economics 310—Advanced Micro Theory I, 3 hr.

Economics 312—Advanced Macro Theory I, 3 hr.

Economics 316—History of Economic Doctrines and Analysis, 3 hr.

If the student has successfully completed Economics 216 (History of Economic Thought) or its equivalent before entering the graduate program, this requirement is satisfied.

Economics 220—Introduction to Quantitative Analysis, 3 hr.

Economics 226—Advanced Statistics, 3 hr.

Thesis Option—

a. An acceptable thesis, 6 hr. Under the thesis option, the student must pass a final oral examination.

b. The following may be substituted for a thesis in meeting the requirements for the M.A.: (1) completion of two courses (minimum of 6 semester hours) in one field of concentration in economics; and (2) submit a research paper that gives evidence of substantial ability to conduct scholarly research.

Program Options

The M.A. program in Economics includes special options conducted by the College of Business and Economics (B & E) jointly with other units on campus. These options include Energy Economics, Manpower Planning and Evaluation, Political Economy, Statistics and Economics, and Mathematical Economics. To earn the M.A. in Economics, students must complete the M.A. core courses and fulfill other requirements pertaining to the particular option.

Energy Economics

Conducted in cooperation with the College of Mineral and Energy Resources (COMER), this option is designed to prepare students in the area of resource economics, including energy and environmental issues. Courses students take include: Economics of the Energy and Petrochemical Sectors, Theory and Policy of Mineral Economics, Models of Mineral Commodity Markets (COMER); and Energy Economics, and Environmental Economics, (B&E). Students are required to submit three graduate papers.

Manpower Planning and Evaluation

Conducted in cooperation with the School of Social Work (SSW), this option is designed to prepare students for jobs in the area of manpower planning and evaluation, especially in state and local government. For the M.A. in Economics, students are required to complete two semesters of field placement. Courses

students take include: Group Theory, Community Organization, Program Design and Evaluation, (SSW); Manpower Economics, Seminar in Labor Economics, Accounting and Fiscal Management, Seminar in Manpower Planning, (B&E).

Political Economy

Conducted in cooperation with the Department of Political Science (PS), this option is designed to provide students with sufficient analytical and research skills to become competent researchers, particularly with regard to public policy problems. Field training on an optional basis may be obtained through a research residency or internship in a public agency. Courses include Politics of Planned Development, Theory of Public Policy Development, Seminar in Policy Development, Political Science Methodology, (PS); and Economics electives selected on the basis of the student's special interests.

Statistics and Economics

Conducted in cooperation with the Department of Statistics (Stat.), this option is designed to prepare students for employment, in the public or private sector, which demands the use of quantitative skills. Courses include Statistics and Probability, Applied Regression Analysis, (Stat.), and Econometrics (B&E).

Mathematical Economics

This option is conducted in cooperation with the Department of Mathematics. (Math.). Students entering this option must previously have taken 12 hours in mathematics, including a course in Calculus equivalent to Math. 51. Courses students take include Advanced Micro Theory II, Advanced Macro Theory II, Quantitative Analysis, Mathematical Economics, Seminar in Mathematical Economics, Introduction to Linear Algebra, and Introduction to Real Analysis.

Doctor of Philosophy (Ph.D.)

At least three years of full-time graduate work beyond the baccalaureate degree are usually required to qualify for the doctorate. A minimum of two consecutive semesters in actual residence as a full-time graduate student is required. To qualify for the Ph.D. degree in economics, students must earn a cumulative grade-point average of 3.0 in courses completed at WVU.

The Ph.D. degree is not awarded for the mere accumulation of course credits nor for the completion of the specified residence requirements. All students are required to complete the graduate core curriculum, prepare themselves in three fields of concentration other than economic theory, fulfill a language requirement, and submit an acceptable dissertation. A minimum of 36 hours of graduate work in economics at the 300 level is required for all candidates for the Ph.D. degree in economics.

Core Courses:

Economics 310—Advanced Micro Theory I, 3 hr.

Economics 311—Advanced Micro Theory II, 3 hr.

Economics 312—Advanced Macro Theory I, 3 hr.

Economics 313—Advanced Macro Theory II, 3 hr.

Economics 316—History of Economic Doctrines and Analysis, 3 hr. (Grade of "B" or better required for Economics 316).

Economics 226—Advanced Statistics, 3 hr.
Economics 320—Quantitative Analysis, 3 hr.
Economics 325—Econometrics, 3 hr.

The student can waive the statistics and econometrics requirement by successful completion of qualifying examinations or by successful completion of Economics 329 (grade "B" or better).

Fields of Concentration. Six semester hours (or the equivalent) must be taken in each of the student's three fields of concentration. Areas of concentration include: econometrics, monetary economics, public finance, public regulation and control, international economics, regional and urban economics, labor economics, economic history, and energy and environmental economics. One of the fields of concentration may be in an outside area (the selection must be approved by the graduate economics faculty).

Language Requirement. Students must demonstrate the ability to read one foreign language or pursue additional specified course work in computer science, philosophy, mathematics, or statistics. An acceptable foreign language is one in which there exists a significant literature in economics and which is approved by the Dean of the Graduate School. For alternatives to satisfying the foreign language requirement, see departmental regulations—"Foreign Language Options."

Comprehensive Examinations. Students must pass written comprehensive examinations in economic theory (microeconomics and macroeconomics) and three fields.

Candidacy and Dissertation. When an applicant has successfully passed the written comprehensive examinations, the applicant will be formally promoted to candidacy for the Ph.D. degree. The candidate must submit a dissertation pursued under a member of the graduate faculty in economics on some problem in the area of the candidate's major interest. The dissertation must present the results of the candidate's individual investigation and must embody a definitive contribution to knowledge. It must be approved by a committee of the graduate faculty in economics. After approval of the candidate's dissertation and satisfactory completion of other graduate requirements, a final oral examination on the dissertation is required.

Ph.D. Program Options

The Ph.D. program includes special options conducted in cooperation with other units on campus. These include Energy Economics, Industrial Relations, and Mathematical Economics. The options specify certain concentrations of course work and comprehensive examinations. Acceptable dissertations are required of all students.

Energy Economics

Conducted in cooperation with the College of Mineral and Energy Resources (COMER), this option is designed for students wishing to specialize in the area of energy, resource, and environmental economics. In addition to the core theory courses, students are expected to complete a field (12 semester hours at the 300 level) in Mineral Resource Economics (COMER), and fields in Energy and Environmental Economics and Econometrics in the Department of Economics. One field in the Department of Economics may be substituted for Econometrics, provided the student successfully completes Economics 325.

Mathematical Economics

This option is conducted in cooperation with the Department of Mathematics. To be admitted into this option, students must have completed a minimum of 12 hours in mathematics, including a course in Calculus equivalent to Math. 51. In addition to the Economics Ph.D. core, students are required to take the following courses:

- Econ. 328—Mathematical Economics
- Econ. 329—Seminar in Econometrics
- Math. 241—Introduction to Linear Algebra
- Math. 251, 252—Introduction to Real Analysis
(Math. 251 and 252 may be replaced by Math. 317, 318).
- Math. 490—Seminar in Mathematical Economics
- Math. Elective—3 hr.

Students are required to successfully complete comprehensive examinations in economic theory, mathematical economics, econometrics, and one other field in economics or mathematics.

Students must demonstrate proficiency in the use of statistical techniques. Stat. 312, Statistical Methods, is required plus an additional 3 hours to be selected from the following: Stat. 341, Stat. 351, Stat. 381, or Econ. 325. Proficiency may be demonstrated by a qualifying examination or obtaining at least a "B" in each course.

Industrial Relations

Graduate work in Industrial Relations typically is interdisciplinary in nature. The Ph.D. option retains this orientation while providing students with a sound understanding of Economic theory and analysis. A minimum of 48 hours of graduate work is required, including the following core curriculum courses:

- Econ. 310—Advanced Micro Theory I
- Econ. 312—Advanced Macro Theory I
- Econ. 220—Introduction to Quantitative Analysis
- Econ. 370—Economic History
- Law 371—Labor Law I
- Psych. 304—Leadership and Human Relations
- Econ. 362—Advanced Collective Bargaining
- I.R. 491—Industrial Relations Research
- I.R. 497—Practicum in Industrial Relations

Students are required to complete three fields of concentration other than Industrial Relations Theory (core curriculum). One field must be Labor Economics and two other fields may be selected from Economics, Industrial Psychology, Public Administration, Statistical Analysis, Personnel Management, Industrial Engineering, or Law. Students must take 6 hours of course work at the 300-level (beyond the core curriculum) in each of these fields and successfully pass a written comprehensive in each field. A two-part comprehensive is also required in Industrial Relations Theory.

INDUSTRIAL RELATIONS

Students may pursue a master of science degree in either of two options in the industrial relations program: Industrial and Labor Relations, or Manpower Planning and Evaluation. Criteria for admission and performance are the same for both.

Admission. To be admitted to a program as a *regular graduate student* the applicant must have earned an undergraduate grade-point average of at least 2.5 ($A=4.0$), and must present a minimum of 21 hours of undergraduate work in the social sciences, these to include at least 3 hours in statistics and 3 hours in labor economics. (For this purpose the social sciences include economics, history, political science, psychology, sociology, anthropology, and general science.)

An applicant with the required grade-point average who has not had the required hours in social sciences may be admitted as a *regular graduate student with deficiencies*. Such a student must remove the specified deficiencies, without graduate credit, in the first semester in residence.

An applicant with an undergraduate grade-point average of at least 2.25 but less than 2.5 may be approved for the program as a *special-provisional graduate student*. A student so classified is required to seek re-classification by the time 9 to 12 semester hours of course work have been completed; to be reclassified as a *regular graduate student* (either category) such a student must have achieved a grade-point average of at least 2.75 in the course work taken in Graduate School.

All applicants must submit scores on the general aptitude portion of the Graduate Record Examinations.

Performance. To be in good standing (and ultimately to receive a graduate degree) graduate students in degree programs are required to maintain a grade-point average of at least 2.75 in all course work undertaken in Graduate School.

Industrial and Labor Relations Option

To receive the master of science degree, the candidate may select either a thesis or a non-thesis program. The non-thesis program requires 36 hours of graduate work which will include the following 18 hours of required courses:

Econ. 262—Collective Bargaining, 3 hr., *or*

Econ. 362—Advanced Collective Bargaining, 3 hr.;

Psych. 301—Personnel Psychology, 3 hr.;

Econ. 211—Micro Economic Analysis, 3 hr., *or*

Econ. 212—Macro Economic Analysis, 3 hr., *or*

Any 300 level, 3 hr. Economics course other than Economics 362, 302, and 390;

Stat. 311—Statistical Methods, 3 hr.;

I.R. 430—Two seminars in Industrial Relations, 3 hr. ea.

The remaining hours will be chosen from the following courses after consultation with the adviser. While the listed courses are preferred, considerable latitude may be given the student by the adviser to choose other courses which are particularly appropriate to the student's background and interest. Approval must be obtained in advance. To receive the master's degree at least 60 percent of a graduate student's courses must be numbered at the 300-level and above.

<i>Industrial Engineering</i>	<i>Hr.</i>	<i>Economics</i>	<i>Hr.</i>
222—Job Eval. and Wage Incent	3	211—Micro Econ. Anal	3
260—Human Factors Eng'g.	3	212—Macro Econ. Anal	3
261—System Safety Eng'g	3	260—Manpower Econ.	3
358—Ind. Eng'g for Ind. Rels	3	263—Economics of Wages	3
360—Human Factors System Des.	3	360—Adv. Labor Econ.	3
361—Ind. Hygiene Eng'g	3	364—Seminar, Labor Econ.	3
<i>Psychology</i>		390—Readings in Econ.	1-3
304—Leadership and Human Rel.	3	<i>Law</i>	
307—Prac. Indust. Interview	3	360—Compensation.	3
313—Directed Studies	1-3	371—Labor Law I	3
<i>Management</i>		349—Labor Law II	2
216—Personnel Management	3	<i>Counseling and Guidance</i>	
225—Business Policy	3	320—Vocational Development and	
301—Administrative Practice.	3	Occupational Choices	3
<i>Public Administration</i>		<i>Sociology and Anthropology</i>	
341—Adm. Org. and Man.	3	203—Collective Behavior	3
343—Public Personnel Adm.	3	204—Complex Organizations.	3
448—Legal Environment	3	233—Industrial Sociology.	3
491—Adv. Study in Pub. Lab. Rel.	3	<i>Statistics</i>	
<i>Industrial Relations</i>		312—Statistical Methods 2	3
491—Adv. Study in I. R.	1-6		

The thesis program requires 30 hours of graduate work which will include the 18 hours of required courses: 6 hours of Industrial Relations 497 — Thesis; and 6 hours of approved electives. An average of 3.0 must be maintained in courses taken before the thesis.

The industrial relations program requires that the student maintain a grade-point average of at least 3.0 on all work taken as a graduate student while enrolled in the College, including prescribed work taken to remove undergraduate deficiencies. In addition, the student must maintain a 3.0 average in all work counting toward the graduate degree. A student whose cumulative grade-point average falls below 2.75 will be placed on probation. If the student's average is not brought up to 2.75 by the end of the following semester, the student will be suspended from the program. A grade below C in any course taken while enrolled as a graduate student will result in suspension from this graduate program.

Manpower Planning and Evaluation Option

To receive the Master of Science degree with a specialization in manpower planning and evaluation, the candidate must successfully undertake a two-semester field replacement in the manpower area, and the following courses:

- Econ. 262—Collective Bargaining, 3 hr. *or*
- Econ. 362—Advanced Collective Bargaining, 3 hr.
- Psych. 301—Personnel Psychology, 3 hr. *or*
- Econ. 211—Micro Economic Analysis, 3 hr.
- Soc. 233—Industrial Sociology, 3 hr., *or*
- Econ. 212—Macro Economic Analysis, 3 hr.
- Stat. 311—Statistical Methods, 3 hr.
- I.R. 430—Two seminars, 3 hr. ea.
- Econ. 360—Advanced Labor Economics, 3 hr.
- Econ. 364—Seminar in Labor Economics, 3 hr.
- Acct. 200—Accounting and Fiscal Management, 3 hr.

S. W. 321—Group Theory, 2 hr.

S. W. 340—Community Development and Planning — Manpower, 2 hr.

S. W. 497—Program Design and Evaluation, 3 hr.

S. W. 351—Community Development, 2 hr.

The grade-point requirements of the industrial and labor relations option apply to this option of the industrial relations program. This manpower planning and evaluation option is a joint specialization between the College of Business and Economics and the School of Social Work.

Courses of Instruction

Accounting

Acctg.

200. *Special Topics*. I, II, S. 1-4 hr. PR: Acctg. 112 or consent. Special topics relevant to accounting. Maximum of 9 semester hours in any or all courses numbered 200 offered by the College may be applied toward bachelor's and master's degrees.
211. *Accounting Systems*. I. 3 hr. PR: Acctg. 115 or 116. Adaptation of accounting procedures to demands of firms. Emphasis on use of quantitative tools, use of computers in accounting, the systems concept, and human behavioral implications of accounting.
213. *Income Tax Accounting*. I. 3 hr. PR: Acctg. 111 or 115 or 116 or consent. Tax laws and the investment and decisions they affect. Taxes are presented in meaningful relationships in order to form a general pattern of knowledge that is easier understood.
214. *Income Tax Accounting*. II. 3 hr. PR: Acctg. 111 or 115 or 116 or consent. Emphasis on income tax practice as developed from the Internal Revenue Code, regulations, rulings and court decisions. Cases and problems covering individuals, partnerships, corporations, and estate and gift returns.
216. *Advanced Managerial Accounting*. II. 3 hr. PR: Acctg. 115 or Acctg. 116. Advanced work in application of cost theory and procedures to cases and problems which emphasize the managerial use of cost information.
217. *Auditing Theory*. I or II. 3 hr. PR: Acctg. 113 or consent. Auditing fundamentals; objectives, ethics, statistical samplings, standards and procedures. Emphasis on FASB and SAS disclosures.
218. *Auditing Practice*. I or II. 3 hr. PR: Consent. Application of auditing theory and procedures, with emphasis on decisions which invoke judgment and are important in independent audits; audit working papers and reports; case studies.
224. *Advanced Accounting Problems*. I or II. 3 hr. PR: Minimum of 18 hr. in accounting with an average grade of B or higher. Analysis and solution of representative C.P.A. problems. (*Course will not be offered in 1978-79.*)
230. *Advanced Accounting Theory*. I or II. 3 hr. PR: Acctg. 112, 115 and consent. Critical analysis of accounting concepts and standards with emphasis on their origin, development, and significance. (*Course will not be offered in 1978-79.*)
299. *Independent Study*. I, II, S. 1-3 hr. PR: Consent. Students will develop and complete a program of specialized studies under the supervision of a cooperating instructor.

- 301. *Managerial Control*. 3 hr. PR: Acctg. 52 and Econ. 125. Use and significance of quantitative techniques of accounting, statistics, and budgeting for planning, control, and decisionmaking.
- 329. *Seminar in Accounting*. 3 hr.
- 491. *Advanced Study*. 1-6 hr.

Economics

Specialized Courses

Econ.

- 200. *Special Topics*. I, II, S. 1-4 hr. PR: Econ. 52 or 55 or consent. Special topics relevant to economics. Maximum of 9 semester hours in any or all courses numbered 200 offered by the College of Business and Economics may be applied toward bachelor's and master's degrees.
- 205. *Current Economic Problems*. S. 3 hr. PR: Econ. 52 or 55 or consent. For students in education only. Acquaints school teachers with reliable source material in economics and instructs them in studying current economic problems.
- 265. *Economics of Social Security*. I or II. 3 hr. PR: Econ. 52 or 55 or consent. Our social and political efforts to provide economic security, including an examination of parallel developments of private insurance.
- 297. *Internship*. I, II, S. 1-12 hr. PR: Econ. 52 or 55 and departmental approval. Field experience in the analysis and solution of economic problems in the public and private sectors.
- 301. *Managerial Economics*. II. 3 hr. For students in the M.B.A. program. Analysis of markets and problems of management in appraising business conditions and in adjusting to changes in product demand, costs, level of output, and profits.
- 302. *Research and Reports*. I, II. 1-3 hr. For students in the M.B.A. program. Sources of business information and research procedures, with application in preparation of reports.

Economic Theory

- 211. *Micro Economic Analysis*. I or II. 3 hr. PR: Econ. 52 or 55. Price and output determination and resource allocation in the firm under various competitive conditions.
- 212. *Macro Economic Analysis*. I, II. 3 hr. PR: Econ. 52 or 55. Forces which determine the level of income, employment, and output. Particular attention to consumer behavior, investment determination, and government fiscal policy.
- 216. *History of Economic Thought*. I or II. 3 hr. PR: Econ. 52 or 55. Economic ideas in perspective of historic development.
- 310. *Advanced Micro Theory I*. I. 3 hr. Theory of production and allocation, utility theory, theory of the firm, pricing in perfect and imperfect markets, models of firm's operations.
- 311. *Advanced Micro Theory II*. II. 3 hr. PR: Econ. 310. General equilibrium analysis, distribution theory, welfare economics.

312. *Advanced Macro Theory I.* II. 3 hr. Classical, Keynesian, and Post-Keynesian theories.
313. *Advanced Macro Theory II.* I or II. 3 hr. PR: Econ. 312. Model of economic growth and fluctuations.
316. *History of Economic Doctrines and Analysis.* I. 3 hr. Writings of the major figures in the development of economic doctrines and analysis.
319. *Seminar in Economics.* I or II. 3 hr.

Quantitative Economics

220. *Introduction to Quantitative Analysis.* I or II. 3 hr. PR: Econ. 125. Principal mathematical techniques employed in economic analysis; introduction to econometrics.
225. *Applied Business and Economic Statistics.* I, II. 3 hr. PR: Econ. 125 or Stat. 101 or consent. Continuation of Econ. 125. Principal statistical methods used in applied business and economic research including multiple regression, index numbers, time series analysis, forecasting models and methods, and sampling design.
226. *Advanced Statistics.* II. 3 hr. PR: Econ. 125 or equiv. Advanced approach to statistical analysis with emphasis on probability, inference, and multivariate statistical techniques.
320. *Quantitative Analysis.* II. 3 hr. PR: Econ. 220 or consent. Linear programming, input-output analysis, game theory, decision theory, and dynamic models.
325. *Econometrics.* I or II. 3 hr. PR: Econ. 226 or Stat. 262 or consent. Specification, statistical estimation, and verification of economic models. Problems of applications of econometric analysis.
328. *Mathematical Economics.* I or II. 3 hr. PR: Consent. Mathematical properties of microeconomic models of general equilibrium and welfare, existence, uniqueness, and stability of equilibrium. Applications of Hamiltonian and maximum principles to growth models and economic control problems. Investigation of separability theorems.
329. *Seminar in Econometrics.* I or II. 3 hr.

Monetary Economics

330. *Monetary Economics.* I or II. 3 hr. Sources and determinants of supply of money; demand for money for transactions and speculative purposes; general equilibrium theory of money, interest, prices, and output; role of money in policy.
334. *Seminar in Monetary Economics.* I or II. 3 hr.

Public Finance

241. *Public Finance.* I, II. 3 hr. PR: Econ. 52 or 55. Governmental fiscal organizations and policy; taxes and tax systems with particular emphasis on federal government and state of West Virginia.
340. *Theory of Public Finance.* I or II. 3 hr. Economic role of government in a mixed economy with regard to resource allocation between public and private sectors,

influence of government upon income distribution and economic stability and growth.

344. *Seminar in Public Finance*. I or II. 3 hr.

Public Regulation and Control

245. *Government and Business*. I, II. 3 hr. PR: Econ. 52 or 55. Market structure, conduct and performance: analysis of the antitrust laws — judicial interpretation and effect on the business sector.
246. *Transportation*. I, II. 3 hr. PR: Econ. 52 or 55. Development of an inland transportation system and relations and policies of transport agencies.
345. *Industrial Organization*. I or II. 3 hr. Economic analysis of market structure, conduct and performance: in-depth evaluation of markets and industries in the United States and the effect of government intervention on firm behavior.
349. *Public Regulation of Business*. I or II. 3 hr. Economic analysis of regulation of specific industries such as public utilities.

International Economics

250. *International Economics*. I or II. 3 hr. PR: Econ. 52 or 55. Development of trade among nations; theories of trade, policies, physical factors, trends, and barriers in international economics.
350. *Advanced International Economics*. I or II. 3 hr. Contemporary theories of international economics; analysis of current problems in world trade and finance.
354. *Seminar in International Economics*. I or II. 3 hr.

Regional Economics

255. *Regional Economics*. I. 3 hr. PR: Econ. 52 or 55. Analysis of the regional economy's spatial dimension, emphasizing interregional capital and labor mobility, the role of cities, objectives and issues of regional policy, lagging regions and Appalachia, growth poles, and regional growth and income distribution.
257. *Urban Economics*. II. 3 hr. PR: Econ. 52 or 55. Analyzes the spatial dimensions of the urban economy, emphasizing both urban economic theory and urban policy. Issues include cities and income inequality, urban upgrading function, blight, economics of ghettos, the economies of urban size.
355. *Advanced Regional Economics*. I or II. 3 hr. Regional income and flow of funds estimation, regional cyclical behavior and multiplier analysis, industrial location and analysis, techniques of regional input-output measurement, impact of local government reorganization on regional public service and economic development.
357. *Advanced Urban Economics*. II. 3 hr. Analyzes the spatial dimensions of the urban economy, emphasizing urban theory, policy, and empirical research. Major subjects include urban income distribution, residential location theory, spatial structure, neighborhood change, blight, ghettos, segregation, renewal, and city size.
359. *Seminar in Regional Economics*. I or II. 3 hr.

Labor Economics

260. *Manpower Economics*. I or II. 3 hr. PR: Econ. 160 or consent. Economics and institutional forces determining the level and composition of labor supply and demand; labor mobility; governmental manpower policies.
262. *Collective Bargaining*. I or II. 3 hr. PR: Econ. 160 or consent. Theory and practice of collective bargaining; contract issues, types of relationships, and role of government policy.
263. *Economics of Wages*. I or II. 3 hr. PR: Econ. 160 or consent. Determination of wage levels and structure; economic and institutional forces determining wage levels and differentials.
360. *Advanced Labor Economics*. I or II. 3 hr. Examination and analysis of our social and economic efforts to solve current manpower problems in the U.S., including structural unemployment and inflation.
362. *Advanced Collective Bargaining*. I. 3 hr. PR: Econ. 262 or consent. Development of the economic theory, empirical analysis and policy implications of the impact of collective bargaining on wages, employment, market structure, and prices.
364. *Seminar in Labor Economics*. I or II. 3 hr.

Economic History

270. *Growth of the American Economy*. I or II. 3 hr. PR: Econ. 52 or 55. Central issues in development of the American economy.
370. *Economic History*. I or II. 3 hr. Examination of the methods of research and issues in economic history of the United States.
374. *Seminar in Economic History*. I or II. 3 hr.

Economic Development

213. *Economic Development*. I or II. 3 hr. PR: Econ. 52 or 55. The problems, changes, and principal policy issues faced by non-industrialized countries in economic development.

Energy and Environmental Economics

380. *Energy Economics*. I. 3 hr. Welfare analysis of supply interruptions and the foreign dependence question. Study of various energy resources in reference to policy alternatives under variant growth conditions and input-output models. Examination of coal industry and coal externalities.
384. *Environmental Economics*. II. 3 hr. Examination of the theoretical and empirical literature dealing with externalities (pollution), the relationships between pollution and social costs, the relationship between energy production and environmental quality, and the optimal strategies for pollution abatement.

Other Economics Courses

390. *Independent Reading in Economics*. I or II. 3-6 hr. Supervised readings in special areas.
491. *Advanced Study*. I, II, S. 1-6 hr. PR: Consent.

- 496. *Graduate Seminar.* I, II. 1 hr. PR: Consent.
- 497. *Research.* I, II, S. 1-15 hr.
- 499. *Graduate Colloquium.* I, II, S. 1-6 hr. PR: Consent.

Finance

Fin.

- 200. *Special Topics.* I, II, S. 1-4 hr. PR: Fin. 111 or consent. Special topics relevant to finance. Maximum of 9 semester hours in any or all courses numbered 200 offered by the College may be applied toward bachelor's and master's degrees.
- 216. *Risk Management.* II. 3 hr. PR: Fin. 115 or consent. Transferable risks with which the entrepreneur must deal. Emphasis on the process by which decisions are made for handling these risks, including an examination of contributions and limitations of insurance system.
- 250. *Applied Security Analysis.* II. 3 hr. PR: Fin. 150 or consent. The systematic selection, assessment, and ranking of corporate securities in a portfolio framework through a synthesis of technical analysis, accounting principles, quantitative techniques for forecasting, fiscal and monetary policies, and behavioral influences.
- 251. *Bank Management.* II. 3 hr. PR: Fin. 111. Study of the management of commercial bank funds. Examination of the principles applicable to the various types of lending and investing within legal restraints of government.
- 299. *Independent Study.* I, II, S. 1-3 hr. PR: Consent. Students will develop and complete a program of specialized studies under the supervision of a cooperating instructor.
- 313. *Financial Administration.* 3 hr. PR: Fin. 111. Problems in business finance including those related to financial structures of corporations and working-capital and fixed-capital needs of a firm.
- 329. *Seminar in Finance.* 3 hr.
- 491. *Advanced Study.* 1-6 hr.

Industrial Relations

I.R.

- 430. *Seminar in Industrial Relations.* I, II. 1-6 hr.
- 491. *Advanced Study.* I, II. 1-6 hr.
- 496. *Graduate Seminar.* I, II. 1 hr.
- 497. *Research.* I, II. 1-15 hr.

Management

Mgt.

- 200. *Special Topics.* I, II, S. 1-4 hr. PR: Mgt. 105 or consent. Special topics relevant to management. Maximum of 9 semester hours in any or all courses numbered 200 offered by the College may be applied toward bachelor's and master's degrees.

205. *The Individual and the Organization*. II. 3 hr. Examination of how the individual, the group, and the organization interact to influence the behavior of the business organization and that of its human resources.
206. *Organizational Theory and Analysis*. II. 3 hr. PR: Mgt. 205 or consent. Influences of structure on the behavior and dynamics of the business organization. Attention on how to be an effective manager.
210. *Business Decision-Making Under Uncertainty*. I. 3 hr. PR: Mgt. 112 or C.S. 1 and Mgt. 111. Analysis of business problems where certainty does not exist. The case approach with actual or realistic data involving more than one business functional area. Solution of unique business problems.
213. *Problems in Business Administration*. I, II, S. 1-3 hr. Selected management problems related to the total enterprise and the emerging technostructure, e.g., managerial and corporate strategy, utilization of resources, social responsibility and government relations, dynamics of new industries.
216. *Personnel Management*. I, II. 3 hr. Systematic study about leading and motivating people whose work behavior is influenced by technology, organization, and management style as those affect the individual and his work groups. Problems in obtaining, developing, maintaining, and directing human resources for an organization.
220. *Deterministic Decision Analysis*. II. 3 hr. PR: Mgt. 112. Study and application of quantitative methods to business problems in which deterministic conditions prevail.
225. *Business Policy*. I, II. 3 hr. PR: Senior standing and consent. Integrated study of policies, organization, facilities, and control techniques of business enterprises.
299. *Independent Study*. I, II, S. 1-3 hr. PR: Consent. Students will develop and complete a program of specialized studies under the supervision of a cooperating instructor.
301. *Administrative Practices*. 3 hr. PR: Mgt. 111 or consent. Interpersonal relationships through which administration becomes effective. Emphasis on human factors, but influences of economic and technological factors also are considered. Focus on importance of harmony between individual needs and organization goals.
302. *Quantitative Business Analysis*. 3 hr. PR: Econ. 125; C.S. 1, or equiv. Review of probability and Bayesian statistics, multiple correlation, linear programming, and planning and control techniques. Decision making using inferential methods, management science techniques, quantitative and statistical software, and computer programming.
313. *Production Administration*. 3 hr. PR: Mgt. 111. Review and application of analytical techniques to complex manufacturing problems. (*Course will not be offered in 1978-79.*)
323. *Administrative Policy*. 3 hr. PR: Consent. An integrated study of policies, organization, facilities, and control techniques of business enterprises.
329. *Seminar in Management*. 3 hr.
491. *Advanced Study*. 1-6 hr.

Marketing

Mkt.

- 200. *Special Topics*. I, II, S. 1-4 hr. PR: Mkt. 111 or consent. Special topics relevant to marketing. Maximum of 9 semester hours in any or all courses numbered 200 offered by the College may be applied toward bachelor's and master's degrees.
- 201. *Focal Points in Marketing*. I. 1-3 hr. PR: Mkt. 111. In-depth study of specialized marketing subjects, e.g., franchising, tourism, packaging, or product development. Each subject is self-contained, spans one-third of a semester, and is valued at 1 credit hour.
- 205. *Consumer Behavior*. II. 3 hr. PR: Mkt. 111. The nature of the consumer decision process in a marketing framework. Emphasis on the psychological and sociological concepts which influence the decision process.
- 210. *Intermediate Markets*. I. 3 hr. PR: Mkt. 111; Corequisite: Mkt. 211 or consent. A study of marketing to three classes of customers: the industrial market, the institutional market, and governmental agencies. The buying-selling process is examined in some detail including the preparation of proposals.
- 211. *Marketing Management*. I, II. 3 hr. PR: Mkt. 111, senior standing. An approach to executive marketing decision making. Simulation through live and written case study should sharpen skills as the student makes analytical evaluations of marketing problems.
- 299. *Independent Study*. I, II, S. 1-3 hr. PR: Consent. Students will develop and complete a program of specialized studies under the supervision of a cooperating instructor.
- 313. *Marketing Administration*. 3 hr. PR: Mkt. 111. Analysis of problems met by management in distributing goods and services efficiently to consumers.
- 329. *Seminar in Marketing*. 3 hr.
- 491. *Advanced Study*. I, II. 1-6 hr.

Creative Arts Center

The Divisions of Art, Music, and Theatre comprise the Creative Arts Center, which strives to provide a comprehensive education in the arts by achieving a balance between comprehensive classroom study of the history, philosophy, and theory of the arts with creative expression and performance.

The \$7 million first phase of the Creative Arts Center building was completed in 1968. The second phase, completed in 1973, accommodates the expanding academic needs of the three divisions, and increases the facilities for instructional programs. The theatres and galleries, all of modern design, provide public performances and exhibits that make a significant contribution toward fulfilling the cultural needs of WVU, the state, and the local region.

Division of Art

Candidates for a Master of Fine Arts in Art, Master of Arts in Art, and Master of Arts in Art Education must have an undergraduate degree in art, art

education, or the equivalent. Any deficiencies in the undergraduate preparation must be completed before the applicant is admitted as a regular graduate student in the program requested.

Request for application to graduate degree programs in art should be addressed to the Office of Admissions and Records, West Virginia University, Morgantown, WV 26506. Applicants must specify the degree and subject area of their choice. Before being admitted to any graduate program, applicants must demonstrate their ability through the presentation of a minimum of 20 2" x 2" color slides presented in 8" x 11" plastic slide holders. Each slide must be labeled with the applicant's name, date, size, and medium. This slide portfolio is sent to the Graduate Adviser, Division of Art, Creative Arts Center, West Virginia University, Morgantown, WV 26506. A self-addressed envelope should be included for return of the portfolio.

Applications for graduate studies are reviewed by the Graduate Art Faculty twice each academic year. Applications and slides must be submitted by November 1 (for the First Semester) or March 1 (for Second Semester). Applicants will be notified of their status by the last week of November or March. Final acceptance will depend on the recommendations of the graduate art faculty and the available facilities. Applicants desiring additional information concerning any of the graduate programs in art or art education should contact the Graduate Art Adviser, Division of Art, Room 419A, Creative Arts Center, West Virginia University, Morgantown WV 26506.

Master of Fine Arts in Art (M.F.A.)

The requirements for the degree are as follows: Completion of a minimum of 60 hours of graduate work to include 36 hours in a single field of art; 12 hours of electives within the Division of Art; 6 hours of electives outside the division; and 6 hours for graduate exhibition and thesis statement. Painting, sculpture, printmaking, graphic design, and ceramics are the major fields of studio concentrations.

All graduate art students enrolled in the M.F.A. program must submit a statement of intention upon successfully completing 12 hours of graduate work toward their degree. The statement of intention should outline the direction and implementation of their studio involvement and include a comprehensive outline of the written thesis statement.

Students accepted in the M.F.A. program are required to spend a minimum of two consecutive full-time semesters in residence.

Students may request up to 30 hours of credit for advanced standing if they meet the regular requirements of the Graduate School and the Creative Arts Center and if they have completed the degree of Master of Arts in Art, or the equivalent. The request for advanced standing must be made to the Division Chairman at the time of application and must be approved by the student's graduate adviser and the Graduate School.

Master of Arts in Art (M.A.)

The requirements for the degree are as follows: Completion of a minimum of 30 hours of graduate work in art. A graduate exhibition and a thesis statement are optional requirements depending on the recommendation of the graduate art faculty.

Master of Arts in Art Education (M.A.)

The degree of Master of Arts in Art Education is offered in cooperation with the College of Human Resources and Education.

	<i>Hr.</i>
1. Graduate Courses in Education	12
Ed. Found. 320 or 304 (Philosophy or History)	3
C&I 307 (Curriculum Development)	3
C&I 380 (Teaching Strategies)	3
Ed. Psych. 300 (Advanced Educational Psychology)	<i>or</i>
Ed. Psych. 440 (Human Development and Behavior)	<i>or</i>
Ed. Psych. 450 (Psychological Foundations of Learning)	3
	12
2. Graduate Courses in Art	18
	30

Art

- 200. *Directed Art Studies*. I, II, S. 1-15 hr. PR: Consent. Studies in sculpture, printmaking, graphic design, drawing, ceramics; includes directed or independent study in special art topics. (May be repeated for credit.)
- 211. *Figure Drawing*. I, II. 3 hr. PR: Art 12, 121, or equiv. Drawing course in compositional structure from the figure.
- 212. *Advanced Drawing*. I, II. 3 hr. PR: Art 211 or equiv. Advanced tutorial drawing course. (May be repeated for credit.)
- 250. *Art History Before 1900*. I. 3 hr. PR: Art 106 or equiv. Significant developments in art before 1900 as found in selected works or periods.
- 260. *Art History After 1900*. II. 3 hr. PR: Art 106 or equiv. Significant developments in art from 1900 as found in selected works or periods.
- 300. *Graduate Art Studies*. I, II, S. 1-15 hr. PR: Consent. Directed or independent study in painting, sculpture, ceramics, printmaking, graphic design, drawing. (May be repeated for credit.)
- 400. *Graduate Exhibition, Thesis Statement*. I, II, S. 3-6 hr. PR: Consent.
- 490. *Teaching Practicum*. I, II. 1-3 hr. PR: Consent. Supervised practices in college teaching of art.
- 491. *Advanced Study*. I, II, S. 3-9 hr. PR: Consent. Investigation in advanced subjects not covered in regularly scheduled courses. Study may be independent or through specially scheduled requirements.
- 496. *Graduate Seminar*. I, II. 1 hr. PR: Consent. It is anticipated that each graduate student will present at least one seminar to the assembled faculty and graduate student body of the student's program.

Division of Music

Prospective graduate students in music are required to have completed the appropriate curriculum of undergraduate study in music at WVU, or its equivalent at another institution of recognized standing. For acceptance as a degree student the applicant must:

1. For the Master of Music degree, have an average of 2.5 on all undergraduate study; for the Ph.D. and Doctor of Musical Arts, have an average of 3.0 on the Master's degree or equivalent.

2. Submit to the Division of Music a score of at least 35 on the Miller Analogies Test.

3. Demonstrate by audition or a tape recording a level of attainment on the major instrument no more than one grade-level below the stated entrance level as indicated for the respective curriculum. Performance proficiency, based on technical ability, repertoire, and musicianship, is graded on a scale from Level 1 to Level 10. A listing of representative material by Level for each performance area is available from the Department of Applied Music of the Division of Music.

Applicants accepted for degree study must take entrance tests in theory and music history, and audition on piano. These tests and auditions will be given two days before registration. The results of these might indicate the need for remedial study. Recent graduates of the Division of Music will be admitted on their past record without these examinations or audition, unless deemed necessary by the Chairman of the Division of Music. Applicants for the areas of Theory and Composition will be tested more specifically in counterpoint (both sixteenth and eighteenth century), form, instrumentation, and orchestration. Applicants seeking acceptance as composition majors also must submit representative compositions for evaluation and approval.

Applicants who have been admitted to the Graduate School, but whose averages and test scores do not meet the qualifications outlined above, will be accepted as Special Graduates. If upon completion of at least 12 semester hours of graduate study they have maintained a B (3.0) average, and when any previous undergraduate deficiencies are removed, such Special Graduates may petition to be accepted as degree students.

The Miller Analogies Test may be taken at any time by appointment at numerous college testing centers around the country. (The Division of Music can supply addresses upon request.) If a tape recording is submitted, it must be of a high quality, 72 ips, and clearly marked as to name, titles of compositions, and types of tracks used (i.e., half track, quarter track mono, quarter track stereo, etc.). The best recordings still leave much to be desired and a personal audition is encouraged if at all feasible. The auditions are administered on Saturdays on announced dates throughout the school year and summer. These dates are available upon request. For each semester or the summer the last date is approximately six weeks before registration.

Master of Music

Candidates must establish an overall grade-point average of 3.0 within a maximum of 36 hours. Applicants will be admitted to candidacy upon the completion of 12 semester hours of graduate study. No student will be admitted to candidacy until the student has removed all undergraduate deficiencies and maintained a 3.0 average in all graduate work completed.

Candidates for the Master of Music degree may major in one of five fields: Music Education, Applied Music, Theory, Composition, and History of Music.

Graduate students majoring in Music Education will be allowed one of four options, to be determined in consultation with the adviser: (1) Thesis option; (2) Recital option (if the candidate demonstrates at least grade level of 8½ ability in the candidate's major performance area when entering); (3) Thirty-six hour option; and (4) Certification option (intended for persons possessing a bachelor's degree

with a major in music), leading to certification for teaching grades K-12 in the public schools of West Virginia. For the first three options there are the following requirements:

- 1. Thirty graduate hours for thesis and recital options, 36 graduate hours otherwise with an average of 3.0.
- 2. Required courses: Music 400 (major performance area); 12 credits of graduate Music Education courses; one course each in the areas of theory and music history.
- 3. Achievement of Level 8 on the major instrument, or, as substitute, demonstration of comparable skill in conducting, or in performance important in elementary school teaching (recorder, guitar, piano, autoharp, etc.).
- 4. Passing an oral examination in areas of music education, music history, and music theory.
- 5. Successful completion of a 4-hour thesis or 2-hour recital for the thesis and recital options, respectively.

For the certification option, a special selection of approximately 24 hours is made in cooperation with the College of Human Resources and Education to satisfy certification requirements. The other hours, for a total of 36, are electives to provide a good background for teaching. Undergraduate courses may be required to make up deficiencies in areas of performance or conducting.

Music Education

Hr.

(PR: Level 2 in piano; level of proficiency in the major performance area appropriate to the option chosen.)

Music Education courses at the 300 or 400 level*	12
M. 343—Contemporary Techniques in Classroom Music	3
M. 344—Appalachian Music for the Classroom	3
M. 346—Music in the Junior High School	2
M. 440—Choral Techniques	2
M. 442—Instrumental Techniques	2
M. 444—Music Education	3
M. 446—Introduction to Research in Music Education	3
M. 448—Psychology of Music Learning	3
M. 449—Psychology of Music	3
One Theory course and one Music History course	5-6
<i>For Thesis option:</i>	
M. 400—Applied Music (major performance area)	4
M. 497—Research (Thesis)	4
Electives	4-5
<i>For Recital option:</i>	
M. 400—Applied Music (major performance area)	6
M. 493—Recital	2
Electives	4-5
<i>For 36-hour option:</i>	
M. 400—Applied Music (major performance area)	4
Electives	14-15
Totals	30 or 36

*Students in the Thesis option must include Music 446.

History of Music

Hr.

(PR: Level 7 in the major performance area; Level 3 on piano; 4 sem. of a foreign language; 12 undergraduate hr. in Music History.)

M. 430—Introduction to Musical Bibliography	2
M. 432—Music in the Middle Ages	4
M. 433—Music in the Renaissance	4
M. 436—Music in the Baroque Period	4
M. 437—Music in the Classic and Romantic Periods	4
Theory elective	3
M. 497—Research (Thesis)	4
Electives*	5
Total	30

*To be eligible for graduation the candidate must demonstrate completion of Level 8 on the major instrument.

Applied Music

Hr.

(PR: Level 10 in the major performance area; Level 3 on piano (Level 5 for organists); for Voice, the same requirement covering French, German, and Italian as that from the B.M. degree in Voice.)

M. 400—Applied Music (major performance area)	8
M. 430—Introduction to Musical Bibliography	2
One of the following courses:	2
M. 496—Lecture Recital	2
M. 497—Research	2
M. 498—Recital	4
Music electives (to include at least one Theory course and one Music History course; no more than 4 hr. in the major performance area)	14
Total	30

Composition

Hr.

(PR: Level 8 in the major performance area; Level 4 on piano; evaluation of previous compositions at the graduate major level.)

One of the following courses:	3
M. 432—Music in the Middle Ages	3
M. 433—Music in the Renaissance	3
M. 436—Music in the Baroque Period	3
M. 437—Music in the Classic and Romantic Periods	3
M. 460—Composition	6
M. 470—Orchestration	2
M. 475—Pedagogy of Theory	3
M. 483—Theory Topics	5
M. 497—Research (Thesis)	4
Electives	7
Total	30

Theory

Hr.

(PR: Level 8 in the major performance area; Level 4 on piano.)

M. 430—Introduction to Musical Bibliography	2
One of the following courses:	3
M. 432—Music in the Middle Ages	3
M. 433—Music in the Renaissance	3
M. 436—Music in the Baroque Period	3
M. 437—Music in the Classic and Romantic Periods	3
M. 470—Orchestration	2
M. 475—Pedagogy of Theory	3
M. 483—Theory Topics	5
M. 497—Research (Thesis)	4
Electives	11
Total	30

A representative public recital is required of candidates majoring in Applied Music. Composition majors must submit as a thesis a composition in a large form.

All candidates for the Master of Music degree are required to participate at least two clock hours per week for two semesters (or summer terms) in a performing group selected with the adviser's approval.

A general comprehensive oral examination must be passed by all candidates for the Master of Music degree. Candidates may repeat this examination after a three-month period. The results of the second oral examination will normally be considered final. The examining committee will decide immediately after an unsuccessful second attempt whether a petition for a third attempt will be granted.

Doctor of Philosophy

Admission. Acceptance to the doctoral programs is competitive, and will be decided on each year in the spring, for entrance the following fall. Applicants to the program leading to the degree of Doctor of Philosophy must present necessary credentials for evaluation of previous training and experience to the Division of Music. This includes a score on the Miller Analogies Test, a transcript of all grades submitted through the WVU Office of Admissions and Records, and evidence that the applicant has had a minimum of 28 semester-hours in liberal arts studies. Before admission to the program the Division may, at its discretion, require the applicant to take entrance tests in various fields of music, or it may require the applicant to be present for a personal interview. Under normal circumstances the applicant must have attained an average grade of B in courses taken for the Master's degree. However, if sufficient professional experience should warrant, the Division may waive the requirement of a B average or may grant an applicant conditional admittance subject to the satisfactory completion of certain specified courses or the attainment of a specified grade-point average within a semester's work.

Fields of Specialization. Applicants shall select a program within one of the following fields of specialization: (1) Theory; (2) Music Education; or (3) Musicology. In addition, a minor field consisting of a minimum of 12 credit hours in another field of music or a cognate field will be required and will be chosen with the adviser's approval. If the applicant's specialization is in Musicology, the minor will ordinarily be chosen from an appropriate area of humanities.

Curriculum. The exact amount and nature of course work undertaken will be determined by the adviser with the approval of the doctoral committee in the light of the applicant's previous preparation and the field of specialization. The applicant is expected to take Music 494 — Doctoral Seminar — three times. Whatever preparatory courses are needed must necessarily be taken early in the course of study (e.g., languages, statistics, bibliography, etc.).

Candidacy. Students meeting the requirements of the Division of Music and the general requirements of the Graduate School will be recommended to the Dean of the Graduate School for admission to candidacy for the degree. These requirements are (in order of occurrence):

1. Demonstrate the ability to read German and French (only one of the two for applicants in Music Education). (Upon recommendation of the adviser and with the approval of the Dean of the Graduate School, a different Romance language may be substituted for French.)

2. Pass written qualifying examinations satisfactorily to show:

- a. Broad knowledge in Theory and Music History and Literature.

- b. Where appropriate, detailed knowledge in the minor field.

- c. Knowledge in depth in the field of specialization.

3. Pass satisfactorily a comprehensive oral qualifying examination.

4. Present and have accepted an outline and prospectus of the dissertation. The requirement for doctoral seminars must be completed before the presentation of the prospectus.

Graduate students who have met these requirements and who have maintained an average of B in courses completed shall be admitted to candidacy. The qualifying examinations, following after satisfaction of the language requirement, shall be considered as one integral (composite) examination consisting of the written and oral parts. The applicant's doctoral committee will assess the written and oral parts within the composite whole. If an applicant does not pass the examination the applicant will be allowed to attempt the entire examination a second time. The second attempt will be considered final. However, the applicant's committee may elect to discourage a second attempt if the first does not indicate probable success upon repetition.

Residence. In general, the requirements for the degree of Doctor of Philosophy contemplate at least three years of full-time graduate work. A minimum of two semesters is required in residence in full-time graduate study at WVU beyond the master's degree or its equivalent.

Dissertation. The candidate must submit a dissertation produced at WVU under the direction of a major professor which demonstrates a high order of independent scholarship, originality, competence in research, and an original contribution to the field of specialization.

Final Examination. If the candidate's dissertation is approved and the candidate has fulfilled all other requirements, the candidate will be admitted to the final oral examination before the candidate's doctoral committee. However, a final examination will not be given in the same semester as the qualifying examination. At the option of the student's committee, a written examination may also be required. The final examination(s) shall be concerned with the dissertation, its contribution to knowledge, its relation to other fields, and the candidate's grasp of the field of specialization.

Time Limitation. Requirements for the degree of Doctor of Philosophy must be completed within seven years.

Doctor of Musical Arts in: Performance and Literature; Composition

Admission. Acceptance to the doctoral programs is competitive, and will be decided on each year in the spring for entrance the following fall. Applicants to the program leading to the degree of Doctor of Musical Arts must present necessary credentials for evaluation of previous training and experience. This includes a transcript of all previous grades (submitted through the WVU Office of Admissions and Records) which must show proof that the applicant has had a minimum of 28 semester hours in liberal arts studies. A score on the Miller Analogies Test must be submitted to the Division of Music. To be admitted to the program the applicant must have attained an average grade of B in courses taken for the applicant's Master's degree.

For performance, copies of programs of recent major recitals must be submitted. The applicant must be approved for the program by an Audition Committee, by giving evidence of superior performance, artistic maturity, and extensive repertoire as specified under Graduate Applied Music Requirements. The Audition Committee includes the Chairman of the Division of Music, the Chairman of the Applied Music Department, and the major professors involved with the degree.

For composition, the applicant must be approved for the program by an Evaluation Committee on the basis of scores presented of the applicant's works, accompanied by recordings if possible, which will show a successful handling of various forms and media and indicate the capacity to attain professional standing in the applicant's field.

Fields of Specialization. The degree of Doctor of Musical Arts is offered in the area of Performance and Literature in the fields of specialization of: (1) Piano, (2) Voice, and (3) Organ, and in Composition.

Curriculum. The exact amount and nature of course work to be undertaken by an applicant will be determined by the adviser with the approval of the Doctoral Committee in the light of the applicant's previous preparation and field of specialization.

Candidacy. Graduate students meeting the requirements of the Division of Music and general requirements of the Graduate School will be recommended to the Dean of the Graduate School for admission to candidacy for the degree. These requirements are (in order of occurrence):

1. Demonstrate minimal acquaintance with German and French by the completion of German 2 and French 2 (or their equivalents) with a grade of C or better. (Students may petition to substitute Italian or Spanish for French.)
2. Pass written qualifying examinations satisfactorily to show:
 - a. Broad knowledge in Theory and Music History and Literature.
 - b. Knowledge in depth: (1) in the literature of the field of specialization or (2) composition.
3. Pass satisfactorily a comprehensive oral qualifying examination.
4. Present a public recital (Performance specialization only).

Graduate students who have met these requirements and who have maintained an average of B in courses completed shall be admitted to candidacy. The qualifying examinations, after fulfilling the language requirement, are considered as one integral (composite) examination consisting of the written and oral parts. The applicant's doctoral committee will assess the written and oral parts within the composite whole. If an applicant does not pass the examination the applicant will be allowed to attempt the entire examination a second time. The second attempt

will be considered final. However, the committee may elect to discourage a second attempt if the first does not indicate probable success upon repetition.

Residence. In general, the requirements for the degree of Doctor of Musical Arts contemplate at least three years of full-time graduate work. A minimum of two semesters is required in residence in full-time graduate study at WVU beyond the master's degree or its equivalent.

Recitals, Performance, and Research (Performance specialization only). Recital, performance, and research requirements should be the equivalent to approximately 20 credit hours. A prospectus indicating the various performances and/or projects to be presented for the satisfaction of these requirements will be drawn up by the candidate with the help of the candidate's major professor, and submitted to the candidate's doctoral committee for approval. (Approximate recital credit *equivalents* to be established by the candidate's committee are: solo recital, 3-5; written research project, 3-5; major opera role, 2-4; lecture recital, 2-4; chamber music program, 2-4; program accompaniment, 1-2; concerto, major oratorio role, 2.) This prospectus should display a variety of kinds of music and types of presentations appropriate for the preparation of an artist-teacher, and may include solo recitals, lecture recitals, chamber music programs, concerto performances, major roles in opera or oratorio, major accompaniments, or written research projects. It would include at least two solo recitals and normally will include either a research project or a lecture recital. Approximately one-half of the 20-credit bloc must be earned after admission to candidacy.

Compositions and Research (Composition specialization only). Composition and research requirements should be equivalent to approximately 20 credit hours. "Equivalent credit" will be assigned by the student's doctoral committee on the basis of four to seven credits for a major work (symphony, opera, etc.) and fewer credits for lesser works. Credits may be assigned both on a qualitative and a quantitative basis. Proposed works will be approved by the committee to insure that sufficient variety and breadth of compositional experience is included. Normally, at least one major work and one written paper will be required. The latter will be a research paper, generally an analysis of some aspect of twentieth-century composition, and will be assessed at 2-4 credit hours.

Final Examination (Performance specialization only). The final examination will consist of a *major* solo recital (which will be regarded as the equivalent of the Ph.D. dissertation defense). Immediately following the public performance the candidate's committee will meet to evaluate the performance as evidence of mature musicianship and finished technique. Such a final examination recital will not be given in the same semester as the qualifying examination.

Final Examination (Composition specialization only). If the candidate's compositions and project are approved and the candidate has fulfilled all other requirements, the candidate will be admitted to the final oral examination before the candidate's doctoral committee. At the option of the candidate's committee, a written examination also may be required. The final examination(s) shall be concerned with the compositions, the project (if any), and the candidate's grasp of the field of specialization and its relation to other fields. The final examination will not be given in the same semester as the qualifying examination.

Time Limitation. Requirements for the degree of Doctor of Musical Arts must be completed within seven years.

Doctor of Education

The degree of Doctor of Education is offered in cooperation with the College of Human Resources and Education. The sequence of prerequisites to admission,

prerequisites to candidacy, and requirements for the degree are set forth in the College of Human Resources and Education section of the *Graduate School Catalog*. The requirements for the degree of Doctor of Education for students in Music are identical with those for students in Education.

Music

Applied Music

- 210. *Piano Class Methods and Materials*. I. 3 hr. Methods, materials, and pedagogical techniques, including presentation of keyboard theory as used in functional piano. Practical organization of piano classes. Laboratory: Observation of experienced class teacher and student teaching. (*Course not offered in 1978-79.*)
- 212. *History of Keyboard Pedagogy and Technic*. II. 3 hr. Study of keyboard development and technique, including pedagogical works of the eighteenth through twentieth centuries and application to specific teaching problems. Laboratory: Student teaching and observation, emphasizing analysis and solution of technical problems.
- 218. *Repertoire*. I. 0-2 hr.
- 219. *Repertoire*. II. 0-2 hr.
- 310. *Secondary Applied Music*. I, II, S. 1 hr. Group or individual instruction in performance on a minor instrument (or voice), with emphasis on methods and materials for school music teachers. (May be repeated for credit.)
- 400. *Applied Music*. I, II. 1-4 hr. (Open to qualified students in any field in Applied Music. May be repeated.) A student must demonstrate ability of grade-level 4 on an instrument to receive credit in Music 400 on that instrument. Students other than music majors may take a maximum of one 30-minute lesson per week. If such students demonstrate ability of grade-level 7, this may be at 2 credits; otherwise, the maximum for such students is 1 credit.
- 409. *Master Class in Applied Repertoire*. I, II. 2 hr. PR: Consent. Designed to give coverage through performance of the literature of a specific D.M.A. Applied Music field. (Course may be repeated for credit.)

Conducting

- 410. *Conducting*. S. 3 hr. PR: Music 51 or equiv. Instrumental and choral conducting. Major works are prepared and conducted through the use of recordings and the large WVU music organizations.

Literature

- 230. *Music of Africa*. I. 3 hr. Traditional music of selected areas of Africa south of the Sahara with particular reference to East Africa. The diverse musical cultures with emphasis on historical background, instruments, ensembles, forms, and styles, and music in its social context.
- 231. *History of Music*. I. 3 hr. Survey of music history from the pre-Christian era to the baroque.
- 232. *History of Music*. II. 3 hr. Survey of music history from the baroque to the contemporary period.
- 330. *Survey of Vocal Music*. I. 3 hr. PR: Music 33-34 or equiv. and consent. Survey of masses, oratorios, cantatas, and operas from the Renaissance to the twentieth century. Solo repertoire will not be included. (*Course not offered in 1978-79.*)
- 331. *Survey of Instrumental Music*. II. 3 hr. PR: Music 33-34 or equiv. and consent. Survey of instrumental ensemble music, chamber music, concertos, symphonies, and other

orchestral music from the late Renaissance to the twentieth century. Solo repertoire will not be included. (*Course not offered in 1978-79.*)

332. *Studies in Contemporary Music*. I. 3 hr. PR: Music 33-34.
334. *Collegium Musicum*. I, II. 1-2 hr. Performance of outstanding musical works not in the standard repertory. Although open as a performance group to upperclassmen, graduate students will select appropriate vocal and instrumental music, investigate modes of performance, prepare any necessary editions, and direct rehearsals under supervision. (May be repeated for credit.)
423. *Keyboard Literature*. S. 3 hr. PR: Music 218, 219. Intensive study of the literature for keyboard instruments and the history of the literature. (*Course not offered in 1978-79.*)
424. *Song Literature*. S. 1-3 hr. PR: Music 218, 219. Intensive study of the Art Song and the Lied and the history of their development. (*Course not offered in 1978-79.*)
430. *Introduction to Musical Bibliography*. I. 2 hr. PR: Music 33, 34 or equiv. Survey of musical bibliography with appropriate research assignments.
432. *Music in the Middle Ages*. II. 3-4 hr. PR: Music 33, 34, or equiv., and consent. Detailed study of the music and musical practice from the beginning of the Christian era to 1400.
433. *Music in the Renaissance*. II. 3-4 hr. PR: Music 33, 34, or equiv., and consent. Continuation of Music 432 through the sixteenth century. (*Course not offered in 1978-79.*)
436. *Music in the Baroque Period*. I. 3-4 hr. PR: Music 33, 34, or equiv., and consent. Detailed study of the music and musical practice of the period from 1600 to 1750. (*Course not offered in 1978-79.*)
437. *Music in the Classic and Romantic Periods*. I. 3-4 hr. PR: Music 33, 34, or equiv., and consent. Continuation of Music 436 covering the period from 1750 to 1900.
438. *History of Notation*. S. 3 hr. PR: Music 33, 34, or equiv. Detailed study in transcribing the musical manuscripts of the Middle Ages. (*Course not offered in 1978-79.*)
439. *History of Notation*. I. 3 hr. PR: Music 33, 34, or equiv. Continuation of Music 438 covering the Renaissance period.
452. *Aesthetics of Music*. II. 2 hr. PR: Music 33, 34 or consent. Examination of the main classical and contemporary aesthetic theories and their applications to music.

Church Music

429. *Survey of Sacred Music*. S. 4 hr. PR: Music 33, 34 or equiv. Study of music suitable to the liturgical year, including the historical background of the Jewish, Catholic and Protestant liturgies. (*Course not offered in 1978-79.*)

Music Education

240. *Clinic Chorus, Band, and Orchestra*. I, II. 1 hr. Experience in selection, preparation, and class performance of music appropriate for high school choral and instrumental groups. Students who have completed four semesters of Music 51 will prepare, teach, and conduct class performances.
243. *Music Workshops*. I, II, S. 1-2 hr. (May be repeated for credit.)
245. *Marching Band Techniques*. I. 2 hr. PR: One semester college marching band experience or consent. Study and practical application of techniques of planning and preparation of school marching band performances.
248. *Music Arranging for Public School Groups*. I, II. 2 hr. PR: Music 66. Practical experience in techniques of making simple, workable arrangements of music for public school choral and instrumental performance groups.

341. *Music in the Elementary School*. I. 3 hr. PR: Music 30, 41, 42, or consent. (Not open to music majors.) Development of skills, procedures, techniques, and materials used by general classroom teacher of music in grades K-8.
342. *Teaching of Music Appreciation*. 3 hr. PR: Music 30, 41, 42, or equiv. Review of information, materials, sources, and techniques involved in teaching appreciation of music in public schools. (Not open to music majors.) (*Course not offered in 1978-79.*)
343. *Contemporary Techniques in Classroom Music*. I. 3 hr. PR: Music 152 or consent. Principles and practice of contemporary techniques in elementary and junior high school classroom music, including those of Orff and Kodaly.
344. *Appalachian Music for the Classroom*. II. 3 hr. Lecture, demonstration, and practical experience in performance of Appalachian vocal and instrumental music and in use of this music in public school classrooms. May involve field trips and construction of inexpensive instruments.
346. *Music in the Junior High School*. S. 2 hr. PR: Music 151, 152 or equiv. Consideration of the potentialities and special needs of the junior high school in music education; programs, procedures, and materials.
440. *Choral Techniques*. II. 2 hr. PR: Music 151, 152 or equiv. Advanced techniques and procedures involved in development of choral ensembles.
442. *Instrumental Techniques*. I. 2 hr. PR: Music 151, 152 or equiv. Advanced techniques and procedures involved in individual performance and instruction through lecture-demonstrations by applied music faculty.
444. *Music Education*. II. 3 hr. PR: Music 151, 152, or equiv. Survey and critical study of the total music education program.
445. *Supervision of Music*. S. 2 hr. PR: Music 151 or 152 or equiv. Concepts, responsibilities, duties and techniques that supervisor needs to effectively exercise leadership in developing, coordinating, and refining the complete Music Education program in public schools from kindergarten through twelfth grade.
446. *Introduction to Research in Music Education*. I. 3 hr. PR: Music 151, 152 or equiv. Methods and measures necessary for conduct and understanding of research in music education.
448. *Psychology of Music Learning*. II. 3 hr. Application of learning theory to music learning; nature of musical talent; music talent testing.
449. *Psychology of Music*. I. 3 hr. Introductory study of musical acoustics and psychology of perception of music.

Opera

419. *Opera Theatre*. I, II. 0-4 hr. PR: Music 19 or consent. Continuation of Music 19. Performance of major roles and advanced production techniques. Qualified students will undertake production-direction projects under supervision.

Theory and Composition

260. *Upper-Division Composition*. I, II. 2 hr. PR: Four semesters Music 160, or consent based on scores submitted. Creative writing with emphasis on practical composition for performance. (May be repeated for credit.)
263. *Counterpoint*. I. 2 hr. PR: Music 68 or consent. Sixteenth century counterpoint.
264. *Counterpoint*. II. 2 hr. PR: Music 68 or consent. Eighteenth century counterpoint.

265. *Analysis of Musical Form*. II. 3 hr. PR: Music 68 or consent. Detailed study of the structure of music.
267. *Electronic Music*. I. 2 hr. PR: Music 68 or consent. Technology of producing electronic music. Methods of producing electronic compositions, relationship between sound signal and sound perceived, ear training, analysis of examples from electronic music literature, and composition of electronic music.
268. *Electronic Music*. II. 2 hr. PR: Music 267. Continuation of Music 267.
460. *Composition*. I, II. 3 hr. PR: Consent. Primarily for candidates for graduate degrees in Theory or Composition. (May be repeated for credit.)
468. *Compositional Techniques in Contemporary Music*. II. 3 hr. Analysis of twentieth-century music with emphasis upon music composed since 1950.
470. *Orchestration*. I, II. 2 hr. PR: Music 172 or equiv. Major projects of orchestration. (May be repeated for credit; max. credit, 6 hr.)
472. *Band Arranging*. II. 2 hr. PR: Music 172 or equiv. Major projects in arranging for the concert band.
475. *Pedagogy of Theory*. I. 3 hr. PR: Music 68 or consent. Consideration of various approaches to the teaching of theory.
483. *Theory Topics*. S. 3-5 hr. Various types of analytical and theoretical problems and approaches to their solutions. (May be repeated for credit; max. credit, 10 hr.)

Research and Recital

200. *Directed Music Studies*. I, II, S. 1-4 hr. PR: Consent. Studies in applied music, music education, music theory, music history, composition; includes directed or independent study in special topics. (May be repeated for credit.)
491. *Special Topics*. I, II. 1-3 hr.
492. *Advanced Studies in Music*. I, II. 1-8 hr. PR: Consent, which in some cases may be contingent upon doctoral foreign language examination or a course in statistics. Intensive individualized reading reported in group discussions. Course may be repeated as many times as necessary, in as many areas as needed, and several different sections (i.e., areas) may be pursued simultaneously.
494. *Doctoral Seminar*. I, II. 2 hr. PR: Consent. Intensive individual investigation and preparation of research papers. (Course may be repeated for credit; max. credit, 8 hr.) Presented by the combined doctoral staff in music.
495. *Dissertational Guidance*. I, II. 1-8 hr.
496. *Lecture Recital*. I, II. 2 hr. PR: Music 430.
497. *Research*. I, II. 1-15 hr. PR: Music 430 or consent.
498. *Recital*. I, II. 1-4 hr. PR: Music 299 (Senior Recital) or consent. Masters Applied students shall be permitted to give a recital only after they pass a qualifying audition before a committee of at least three specialists in the area, in a semester previous to that in which the recital is to be given.

Division of Theatre

Master of Arts

Admission. Prospective candidates for the degree of Master of Arts in Theatre must have an undergraduate degree in Theatre, an equivalent degree, or acceptable

professional experience. Ordinarily, a minimum of 30 semester hours in Theatre at the undergraduate level is expected to have been completed with a grade-point average of no less than 2.75. Any deficiencies in undergraduate preparation must be completed, without credit, before the applicant is admitted as a regular graduate student in the program.

A score on the Miller Analogies Test must be submitted to the graduate adviser of the Division of Theatre. In addition, the Division requires that a 250-300 word statement regarding the applicant's present career goals be submitted.

The applicant should be prepared to visit Morgantown for an interview with selected members of the faculty. Applicants intending to specialize in acting-directing should prepare an audition, and those intending to specialize in design-technical theatre should present a portfolio representative of past experience and training. For further details regarding this requirement, address inquiries to: Graduate Adviser, Division of Theatre, West Virginia University, Morgantown, WV 26506.

Fields of Specialization. Applicants should select a field of specialization in either: (1) Acting-Directing, or (2) Design-Technical Theatre.

Requirements. Successful completion of the minimum number of required graduate hours in one of the two following programs:

A. *Thesis Program:* (1) At least 30 semester hours of graduate credit, no more than 9 of which will be in research or thesis. Required courses are: Theatre 431; 460 (6 hr.); 400; 386; 362 or 375; 497 (6 hr.); 200-level courses (6 hr.); (2) Written comprehensive examinations in two areas: (a) the history, literature, and theory of the theatre; and (b) *either* acting and directing *or* design and technical theatre. These examinations are administered late in the student's graduate program, and only if and when the student has a 3.0 grade-point average or 75 percent of the student's credit hours are of B grade or higher; (3) Submission for approval by the student's graduate committee of a thesis demonstrating original research and scholarly reporting; (4) An oral examination on the thesis.

B. *Non-thesis Program:* (1) At least 36 semester hours of graduate credit. Required courses are: Theatre 431; 460 (6-9 hr.); 400; 386; 362 or 375; 497 (6 hr.); 200-level courses (9-12 hr.); (2) Written and oral comprehensive examinations in two areas: (a) the history, literature, and theory of the theatre; and (b) *either* acting and directing *or* design and technical theatre. Either a 3.0 grade-point average or 75 percent of B grades for the hours carried is prerequisite to taking comprehensive examinations.

Doctor of Education

The degree of Doctor of Education is offered to a limited number of students in cooperation with the College of Human Resources and Education. Information regarding prerequisites to candidacy and requirements for the degree may be obtained from the Chairman of the Division of Theatre.

Theatre

202. *Advanced Scene Design.* II. 3 hr. PR: Theatre 100, 102, or consent. Lecture and laboratory in theories of scene design for stage and television, including actual construction of designs. (Open to juniors, seniors, and graduate students.)
203. *Advanced Theatre Lighting Design.* I. 3 hr. PR: Theatre 103 or consent. Advanced theories of lighting and design for the stage. Practical experience with advanced lighting equipment.

204. *Advanced Costume Design*. II. 3 hr. PR: Theatre 104 or consent. Individual study in design styles and techniques. Survey of costume design in theatre today.
250. *Advanced Problems in Interpretation*. I. 3 hr. PR: Theatre 50 and consent. Deals with individual problems of advanced students in interpretation.
251. *Professional Reading*. II. 3 hr. PR: Consent. Intensive training in interpretation. Designed to meet needs of the individual. Full-length public recital prepared and presented. (Limited enrollment.)
260. *Theatre Performance and Rehearsal Laboratory*. I, II. 3-6 hr. Participation in assigned theatre projects. Appreciation of creativity and performance techniques in the theatre. (Majors only. Max. credit, 6 hr.)
262. *Advanced Scene Painting*. II. 1 hr. Advanced techniques in scene painting. (*Course will not be offered in 1978-79.*)
275. *Advanced Acting*. I. 3 hr. PR: Theatre 75 and consent. Advanced theories in acting to include script and style analysis — modern and historical.
276. *Actors Studio*. II. 1 hr. PR: Theatre 76, 176, 275, or consent. Advanced laboratory experience in acting and production styles of historical and modern theatre through the use of staged scenes.
278. *Repertory Theatre*. S. 1-6 hr. PR: Consent. Rehearsal and performance techniques for producing plays in rotating repertory. Emphasis is on creation of a synthesized company of performers, designers, and technicians. (May be repeated for a maximum credit of 12 hr.)
280. *Advanced Play Directing*. II. 3 hr. PR: Theatre 180 or consent. Emphasis on work of director as an integrating artist. High level of proficiency in direction of a one-act play required of all students enrolled.
281. *Theatre Dialects*. I, II. 3 hr. PR: Consent. Study and mastery of fifteen common dialects used in theatre, motion pictures, and television. (*Course will not be offered in 1978-79.*)
282. *Creative Dramatics*. I, II, S. 3 hr. PR: Theatre 75 or consent. Study and practice of creative dramatic activity as a method of learning and self development for children.
284. *Puppetry*. I. 3 hr. PR: Theatre 75 or consent. Comprehensive survey of construction and manipulation techniques of puppets. Evaluation of role of puppetry in child behavior and therapy techniques.
290. *Playwriting*. II. 3 hr. PR: Consent. Development of creative ability in dramatic composition. Techniques and problems of playwriting. Of cultural value, but primarily a writing course.
295. *Theatre History (Greeks to 1700)*. I. 3 hr. Examination of the major theatrical periods from the Greeks to the eighteenth century.
296. *Theatre History (1700 to the Present)*. II. 3 hr. PR: Theatre 295. Examination of the major theatrical periods from the eighteenth century to the modern day.
320. *Plays in Performance*. S. 3 hr. Study of the performance process from conceptualization, through rehearsal and planning, to final performance before an audience. Emphasis on the unified work of director, designer, and performer. (*Course will not be offered in 1978-79.*)
362. *Styles of Production Design*. I. 3 hr. PR: Theatre 295, 296, or consent. Extensive and intensive study of production styles in costume, lighting, and scene design.
375. *Styles of Acting and Directing*. II. 3 hr. PR: Theatre 180 and 280, or consent. Extensive and intensive study of acting and directing styles.

386. *Drama Criticism and Aesthetics*. II. 3 hr. Survey of chief critical and aesthetic theories of theatre — ancient, modern, and contemporary.
400. *Applied Creative Performance*. 3 hr. Creative projects and/or performance. Must have faculty approval as part of student's graduate program.
431. *Research Methods and Survey*. 3 hr. PR: Consent. Research methods and techniques and general survey of the field of theatre.
444. *Survey of Educational Methods and Practices*. 3 hr. Survey and critical study of the total theatre education program. (*Course will not be offered in 1978-79.*)
460. *Specialized Seminars*. 3-9 hr. PR: Consent. Selected fields of study in theatre. (May be repeated for a max. of 9 hours.)
491. *Advanced Study*. I, II, S. 1-6 hr. PR: Consent. Investigation in advanced subjects which are not covered in regularly scheduled courses. Study may be independent or through specially scheduled lectures.
497. *Research*. I, II. 1-15 hr.
499. *Graduate Colloquium*. I, II, S. 1-6 hr. PR: Consent. For graduate students not seeking coursework credit but who wish to meet residence requirements, use University facilities, and participate in its academic and cultural programs.

Engineering

A student desiring to take courses for graduate credit in the College of Engineering must first comply with the appropriate regulations of the Graduate School.

To become a candidate for a degree a student must apply for admission through the Office of Admissions and Records to the major department of the student's choice. Acceptance by the major department will depend upon review of the student's academic background and available facilities in the department.

An applicant with a baccalaureate degree, or its equivalent, from a department accredited by the Engineers' Council for Professional Development (ECPD) will be admitted on the same basis as engineering graduates of WVU. Lacking these qualifications, an applicant must first fulfill the requirements of the department in which the student is seeking an advanced degree.

No credits which are reported with a grade lower than C are acceptable toward an advanced degree.

To qualify for an advanced degree, the graduate student must have a grade-point average of at least 3.0 based on all courses acceptable for graduate credit for which the student has received a grade from WVU.

A graduate student in the College of Engineering must comply with the regulations of the major department and with the requirements as stated in the "Guide to the Graduate Program in Engineering."

Master of Science

Each department in the College of Engineering, except Agricultural Engineering, has a designated M.S. degree and the College has an undesignated degree, Master of Science in Engineering. For all M.S. degrees each candidate will, with the approval of the candidate's Advisory and Examining Committee, follow a planned program which must contain a minimum of 30 semester credit hours no

more than 12 of which can be at the 200 level. If a thesis or a problem report is part of the candidate's program, not more than 6 semester credit hours of research leading to an acceptable thesis nor more than 3 semester credit hours of work for an acceptable problem report may be applied toward the semester credit hour requirement.

Individual departments may establish minimum requirements greater than those adopted for the College as a whole; these departmental requirements are contained in the *Graduate School Catalog*.

The Master of Science in Engineering program is designed for students who desire to pursue work in areas other than that of their baccalaureate degree in engineering or science. Graduate students who wish to become candidates for the degree should register with the department in which the major portion of the work is to be done.

Admission to candidacy for an M.S. degree is required before obtaining that degree. A graduate student may apply for admission to candidacy by formal application after completing a minimum of 12 semester hours of graduate courses with a grade-point average of at least 3.0, based on all graduate courses, taken in residence, for which the student has received a grade at the time of application.

Doctor of Philosophy

The College of Engineering has an interdisciplinary program leading to the degree of Doctor of Philosophy. The academic units approved for participation in this program are: Aerospace Engineering, Chemical Engineering, Civil Engineering, Electrical Engineering, Industrial Engineering, Mechanical Engineering and Mechanics, and College of Mineral and Energy Resources.

Admission. Admission to the Graduate School is required of all applicants for admission to a program of study and research leading to the Ph.D. Applicants for admission are expected to have successfully completed a Bachelor of Science or Master of Science degree program in some phase of engineering equivalent to the program leading to this degree in effect at WVU. Admission to the Graduate School does not necessarily assure entrance into the College of Engineering Ph.D. program.

After the student has earned 24 to 36 graduate credit hours (or completed Master's degree requirements), the student and the academic adviser will submit a plan of study to the College's Engineering Graduate Committee. A student becomes admitted to the College's interdisciplinary program upon formal approval of the plan of study.

Candidacy. After admission to the program and after a period of residence, the applicant will be admitted to a comprehensive preliminary or qualifying examination (written and oral) in which the student must demonstrate: (a) a grasp of the important phases and problems of the field of study and an appreciation of their relation to other fields of human knowledge and accomplishments; and (b) the ability to employ rationally the instruments of research developed in the major field.

When an applicant has successfully passed the comprehensive examination the student will be formally admitted to candidacy for the doctor's degree.

Curriculum. The Doctor of Philosophy degree is not awarded for the mere accumulation of course credits nor for the completion of a definite residence requirement. The amount and nature of the course work undertaken by the candidate will be established for each individual candidate with the object of insuring a rational and coherent progression of academic development beyond the Bachelor

of Science degree. However, to attain the educational objectives of the College's interdisciplinary program, each program of study must contain at least one of the following:

- a. One 12-hour minor in a department of engineering or in any area other than the candidate's major department provided the candidate's program includes at least 6 hours of engineering courses outside his major department or
- b. One 6-hour minor of engineering courses outside the candidate's major department and a second 6-hour minor in any area outside the candidate's major department, suitable to the student's educational objective.
(As used above, an "area" should form a logically coherent set of courses which complement the student's educational objectives. The courses may be taken from one or more University units if these courses constitute such a coherent set.)

In addition, minors in areas other than engineering are encouraged to broaden the candidate's knowledge and the appreciation of human accomplishments.

Residence. The requirements for the degree of Doctor of Philosophy contemplate at least three years of full-time graduate work beyond the bachelor's degree. This must include a minimum of two semesters of residence in full-time graduate study at WVU.

Dissertation. The candidate must submit a dissertation on a topic within the area of the student's major interest. The dissertation must represent the results of independent research and must constitute a definite contribution to knowledge. It is anticipated that the work leading to the completion of the dissertation would require 24 hours in research and/or dissertation credits or satisfactory evidence of equivalent time devoted to research and preparation of the dissertation.

Final Examination. Upon completion and approval of the dissertation and fulfillment of all other requirements, the candidate shall pass a final examination conducted by a committee of at least five members recommended by the major department and appointed by the Dean of the Graduate School. The examination shall be primarily a defense of the dissertation although other questions necessary to establish the qualifications of the candidate for the degree may be in order.

Doctor of Education

The degree of Doctor of Education is offered in cooperation with the College of Human Resources and Education. The sequence of prerequisites to admission, prerequisites to candidacy, and requirements for the degree are set forth in the Education section of the *Graduate School Catalog*. The requirements for the degree of Doctor of Education for students in Engineering are identical with those for students in Education.

General Engineering

Courses in General Engineering

260. *Assessment of Energy Systems*. 3 hr. A comparative study of energy systems for use in meeting the energy demands of the nation. Conversion processes for utilizing fossil fuel, nuclear, geothermal, and solar sources for supplying clean fuels and energy.
325. *Ordinary Differential Equations in Engineering Analysis*. 3 hr. Solution techniques for linear and nonlinear ordinary differential equations in application to engineering problems. Emphasis on approximate and numerical methods including digital com-

puter techniques. Iterative, asymptotic and weighted-residual methods; and the numerical solution of ordinary differential equations in engineering analysis.

425. *Partial Differential Equations in Engineering Analysis*. 3 hr. The origin and solution of linear and nonlinear partial differential equations in engineering analysis. Analytical and approximate methods of solution. Numerical procedures for the integration of parabolic, elliptic, and hyperbolic partial differential equations in engineering applications.

AEROSPACE ENGINEERING

Master of Science in Aerospace Engineering

Students must comply with rules and regulations as outlined in general requirements for graduate work in the College of Engineering.

Thesis. Normally a thesis is required of all candidates for the degree of Master of Science in Aerospace Engineering. Approval by the Advisory and Examining Committee is necessary before the thesis will be accepted. The thesis must be presented in a form that conforms to general requirements of the Graduate School, and in addition should conform to additional thesis requirements of the Department of Aerospace Engineering.

Whether or not a thesis is required shall be determined by the department and shall be recorded in the student's file as a part of a planned program.

Final Examination. Each candidate for the master's degree shall pass a final examination administered by the student's Advisory and Examining Committee.

Courses. The following grouping of courses is given as a guide for selecting a graduate program leading to the degree of Master of Science in Aerospace Engineering:

Group I. Required of all candidates. Six semester credit hours of advanced mathematics beyond a first course in differential equations.

Group II. Major. Minimum of 9 semester hours of aerospace engineering courses, other than A.E. 497, in the 200, 300, and 400 series.

In order to meet the minimum requirements for the degree of Master of Science in Aerospace Engineering, additional courses may be taken from the following, subject to the approval of the student's Advisory and Examining Committee: (1) Courses from Groups I and II; (2) Aerospace engineering courses in the 200 series which are not required for the degree of Bachelor of Science in Aerospace Engineering; (3) Physics and chemistry courses in the 200 and 400 series; and (4) Courses in other departments of the College of Engineering in the 200 to 400 series.

Doctor of Philosophy

A candidate for the degree of Doctor of Philosophy must comply with the rules and regulations as outlined in general requirements for graduate work in the College of Engineering.

Candidates for the Doctor of Philosophy degree, regardless of their specific major, may be required to attain a proficiency in each of the following areas: (1) fluid mechanics, (2) thermodynamics, and (3) applied mathematics.

Research work for the doctoral dissertation must show a high degree of originality on the part of the student and must constitute an original contribution to the field of aerospace engineering. It must have good literary form and style, and must give a thorough survey of prior literature in the subject. The candidate is

required to take a final oral examination upon completion of the dissertation in defense of the research.

Aerospace Engineering

Ag.E.

215. *Experimental Fluid Dynamics II*. 3 hr. PR: A.E. 115 Continuation of A.E. 115 with increased emphasis on dynamic measurements. Shock tube/tunnel and subsonic and supersonic measurements. Experiments include optical techniques, heat transfer to models, and viscous flow measurements. Error analysis of test data. 2 hr. lec., 3 hr. lab.
216. *Applied Aerodynamics*. 3 hr. PR: A.E. 140. Chordwise and spanwise airload distribution for plain wings, wings with aerodynamic and geometric twist, wings with deflected flaps, and wings with ailerons deflected. Section induced drag characteristics. 3 hr. lec.
220. *Guided Missile Systems*. 3 hr. PR: A.E. 112 and/or Conc.: A.E. 150. Design philosophy according to mission requirements. Preliminary configuration and design concepts. Aerodynamic effects on missiles during launch and flight. Ballistic missile trajectories. Stability determination by analog simulation. Performance determination by digital and analog simulation. Control, guidance, and propulsion systems. Operational and reliability considerations. 3 hr. lec.
232. *V/STOL Aerodynamics*. 3 hr. PR: A.E. 112. Fundamental aerodynamics of V/STOL aircraft. Topics include propeller and rotor theory, helicopter performance, jet flaps, ducted fans and propeller-wing combinations. 3 hr. lec.
234. *Fluid Dynamics III*. 3 hr. PR: A.E. 112. Fundamentals of viscous flow and the Navier-Stokes equation; incompressible laminar flow in tubes and boundary layers; transition from laminar to turbulent flow; incompressible turbulent flow in tubes and boundary layers. 3 hr. lec.
235. *Fluid Dynamics IV*. 3 hr. PR: A.E. 112. One-dimensional, non-steady gas dynamics. Shock tube theory and applications. Fundamentals of supersonic and hypersonic flow and the determination of minimum drag bodies. 3 hr. lec.
242. *Flight Testing*. 3 hr. PR: A.E. 140. Applied flight test techniques and instrumentation, calibration methods, determination of static performance characteristics, and introduction to stability and control testing based on flight test of Cessna Super Skywagon airplane. Flight test data analysis and report preparation. 1 hr. lec., 6 hr. lab.
249. *Space Mechanics*. 3 hr. PR: Math. 18, M.E.M. 51. Flight in and beyond the earth's atmosphere by space vehicles. Laws of Kepler and Orbital theory. Energy requirements for satellite and interplanetary travel. Exit from and entry into an atmosphere. 3 hr. lec.
250. *Advanced Topics in Propulsion*. 3 hr. PR: A.E. 150 or consent. Special problems of thermodynamics and dynamics of aircraft power plants. Chemical rocket propellants and combustion. Rocket thrust chambers and nozzle heat transfer. Nuclear rockets. Electrical rocket propulsion. 3 hr. lec.
260. *Design of Flight Structures I*. 3 hr. PR: A.E. 161. Structural design and analysis of flight vehicle members. Layout and detail design of specified components are required. 1 hr. lec., 6 hr. lab.
265. *Aeroelasticity*. 3 hr. PR: A.E. 160. Vibrating systems of single degree and multiple degrees of freedom, flutter theory and modes of vibration, torsional divergence, and control reversal. 3 hr. lec.
280. *Aerospace Problems*. 1-6 hr. Upper division and graduate.

285. *Thesis*. 2-6 hr. PR: Senior standing and consent.
291. *Introduction to Research*. 1-3 hr. PR: Senior standing and consent. Methods of organizing theoretical and experimental research. Formulation of problems, project planning, and research proposal preparation.
292. *Research Problems*. 2-6 hr. PR: A.E. 291 or consent. Performance of the research project as proposed in A.E. 291. Project results are given in written technical reports, with conclusions and recommendations.
300. *Seminar*. Credit. Attendance required of all graduate students at scheduled Aerospace Engineering seminars.
315. *Fluid Flow Measurements*. 3 hr. PR: A.E. 112 or consent. Principles and measurements of: static and dynamic pressures and temperatures, velocity and Mach number forces. Optical techniques and photography, Design of experiments. Review of selected papers from the literature. 2 hr. lec., 3 hr. lab.
380. *Special Problems*. 2-4 hr. PR: Consent of department chairman. For graduate students in the non-research program. The student will select a specialized field and follow a course of study in that field under the supervision of a counselor.
381. *Specialized Study Program*. 1-6 hr. PR: Consent. Discussion, individual study reports in aerospace engineering.
411. *Dynamics of Viscous Fluids*. 3 hr. PR: Consent. Exact solutions of the Navier-Stokes equations. Laminar incompressible and compressible boundary layer theory, similarity solutions and integral methods. 3 hr. lec.
412. *Fundamentals of Turbulent Flow*. 3 hr. PR: A.E. 411 or consent. Basic experimental data. Application of semi-empirical theories to pipe, jet and boundary layer flow. Turbulent heat and mass transfer. Statistical theory of turbulence and recent applications. 3 hr. lec.
413. *Dynamics of Real Gases*. 3 hr. PR: A.E. 411 or consent. Fundamentals of multicomponent, chemically reacting, gas flows; thermodynamic properties of equilibrium mixtures from statistical mechanics; chemical kinetics; effects of the chemical model on high-temperature, high-speed flow properties.
425. *Perfect Fluid Theory*. 3 hr. PR: Consent. Conformal mapping including Schwarz-Christoffel and Joukowski transformations. Inviscid flows over airfoils, spheres, cones, wedges, and bodies of revolution. 3 hr. lec.
435. *Gas Dynamics I*. 3 hr. PR: A.E. 112 or consent. Nonsteady gas dynamics and shock tube theory. Shock tubes in aerospace research. Compressible flow theory in subsonic, transonic, and supersonic regimes. 3 hr. lec.
436. *Gas Dynamics II*. 3 hr. PR: A.E. 435 or consent. Transonic flow-hodograph method, the Chaplygin-Karman-Tsin approximation. Hypersonic flow-bluntbody field theory. Shock wave and viscous interaction with flow fields, blastwave theory and similar solutions. 3 hr. lec.
440. *Advanced Flight Mechanics*. 3 hr. PR: A.E. 112, 140. Dynamic stability. Obtaining flight characteristics of the vehicle from dynamic flight test techniques, such as frequency response, and transient response methods. Problems of automatic control. 3 hr. lec.
449. *Space Mechanics*. 3 hr. PR: Math. 245, A.E. 112, 150. Variational formulation of mechanics. Theory of orbits and trajectories with applications to astronomical problems. Introduction to the space environment. 3 hr. lec.
450. *Fundamentals of Combustion*. 3 hr. PR: A.E. 112 or consent. Kinetic theory, transport phenomena, chemical equilibrium and reaction kinetics. Flames, their gross properties, structure and gas dynamics. Solid and liquid propellant combustion. 3 hr. lec.

458. *Foundations of Magnetohydrodynamics I.* 3 hr. PR: Consent. Ionization in gas flows; equations of state, charge, mass, momentum, and energy conservation; effects of self-generated and external electric and magnetic fields on electrically conducting fluids and transport coefficients. 3 hr. lec.
459. *Applied Magnetohydrodynamics II.* 3 hr. PR: Consent. Incompressible and viscous MHD channel flow; plane waves in fluids, discontinuities and MHD shock waves; applications of MHD to electric power generation, etc. 3 hr. lec.
465. *Dynamics of Aerospace Structures I.* 3 hr. PR: A.E. 474 or consent. Free and forced vibrations of systems with finite and infinite degrees of freedom. Effect of rotary inertia and shear on lateral vibrations of beams. Hamilton principle and Lagrange equations in vibration problems. 3 hr. lec.
466. *Dynamics of Aerospace Structures II.* 3 hr. PR: A.E. 465. Two- and three-dimensional wing theory in incompressible and compressible flow. Wings and bodies in three-dimensional unsteady flow. 3 hr. lec.
474. *Advanced Aerospace Structures I.* 3 hr. PR: A.E. 161 or consent. Stress analysis; deflection of trusses and beams. Statically indeterminate problems. Hardy cross moment distribution and slope deflection methods. Matrix methods of structural analysis; force and displacement methods. 3 hr. lec.
475. *Advanced Aerospace Structures II.* 3 hr. PR: A.E. 474 or consent. Principles in structural analysis, beam-column, sandwich beams and plates. Methods of obtaining exact and approximate solutions (Raleigh-Ritz, Galerkin, etc.). Buckling loads in compression. Stiffened panels, wrinkling in sandwich construction. Minimum weight design. Shells. 3 hr. lec.
497. *Research.* 1-15 hr.

(See additional graduate-level engineering courses listed under "Courses of Instruction in General Engineering," page 183.)

AGRICULTURAL ENGINEERING

Agricultural Engineering

Ag.E.

201. *Farm Structures.* II. 3 hr. PR: M.E.M. 52. Design of structures for housing, recreation, agriculture, forestry, and related rural activities. Structural materials selection will be based on environmental and strength requirements, durability, economics and aesthetic values. 2 hr. rec., 3 hr. lab.
210. *Electric Power.* II. 3 hr. PR: E.E. 105. Design of systems using electrical energy in urban, rural and recreational applications. Electric power generation, safe wiring, lighting, heating, motors, control systems and their applications for air conditioning, water and material handling systems. 2 hr. rec., 3 hr. lab.
220. *Agricultural Process Engineering.* II. 3 hr. PR: C.E. 115, M.E.M. 140. Handling and processing of materials. Fluid flow, materials handling, shaping, and grading, heat and mass transfer, drying, refrigeration, processing instrumentation and controls, cost analysis and processing plant analysis. 2 hr. rec., 3 hr. lab.
230. *Farm Power.* I. 3 hr. PR: M.E.M. 140. Application of power sources to stationary and mobile equipment used in forestry and agriculture. Includes engines and power units, transmission, control, man-machine interface, environmental impact and energy input efficiency. 2 hr. rec., 3 hr. lab.

240. *Hydrology*. I. 3 hr. PR: C.E. 115. The hydrologic cycle with emphasis on precipitation and runoff as related to design of hydraulic structures, soil and water conservation, and flood control. 3 hr. rec.
250. *Soil and Water Conservation*. I. 3 hr. PR: C.E. 115. Principles and practices in the development, conservation, utilization and management of soil and water resources. 2 hr. rec., 3 hr. lab.
260. *Properties of Biological and Animal Materials*. II. 3 hr. PR: Biol. 1, M.E.M. 52 or consent. Physical properties of biological materials as related to harvesting, handling and transporting, conditioning, preserving and storing operations. Size, shape, density, moisture content elastic and viscoelastic properties, strength and aerodynamic response. 2 hr. rec., 3 hr. lab.
280. *Agricultural Engineering Problems*. 1-3 hr. PR: Consent. Special problems relating to agricultural engineering.
290. *Elements of Machinery Design*. II. 3 hr. PR: M.E.M. 140. Analysis of design and management practices for agricultural and forestry production machinery. Traction and stability, power transmission systems, versatility, operational criteria, quality and safety. 2 hr. rec., 3 hr. lab.
340. *Problems in Hydrology*. I. 3 hr. PR: Ag.E. 240. Special problems in hydrograph analysis, hydrologic performance of small watersheds, erosion and sedimentation, hydro-meteorological studies, flood runoff and peak discharge, drought, river forecasting, frequency analysis of hydrologic data. 3 hr. rec.
341. *Physical Climatology*. II. 3 hr. PR: Consent. Physical principles underlying the variations and changes in climate, climatic controls, elements of microclimatology, engineering applications and uses of climatic data. 3 hr. rec.
491. *Advanced Study*. I, II, S. 1-6 hr. PR: Consent. Investigation in advanced subjects which are not covered in regularly scheduled courses. Study may be independent or through specially scheduled lectures.
496. *Graduate Seminar*. I, II. 1 hr. PR: Consent. Each graduate student will present at least one seminar to the assembled faculty and graduate student body of the student's program.
497. *Research*. I, II, S. 1-15 hr.
498. *Thesis*. I, II, S. 2-4 hr. PR: Consent.
499. *Graduate Colloquium*. I, II, S. 1-6 hr. PR: Consent. For graduate students not seeking course work credit but who wish to meet residence requirements, use the University's facilities, and participate in its academic and cultural programs.

Forest Engineering

For. E.

281. *Forest Roads*. I. 3 hr. PR: C.E. 1 or 5 or consent. Forest and rural earth-gravel roads. Aesthetic, planning, design, construction and maintenance procedures. Surveys, route selection, service standards, curves and grades, cuts and fills, drainage structures, and bridges. 3 hr. rec.
291. *Logging Systems*. II. 3 hr. PR: Wd. Sc. 130 or consent. The engineering and economic aspects of equipment for short- and long-wood logging systems. Equipment cost analysis, transportation systems, equipment specifications, accident control and safety. 3 hr. rec.
391. *Logging Systems Engineering*. I. 3 hr. PR: Math. 18 or consent. Theory and design of modern forest harvesting systems such as balloon logging, cableways, pipelines and

conveyors. Design features of specialized forest harvesting machines and devices. Systems engineering approach to equipment utilization. 3 hr. rec.

392. *Hydraulic Power*. II. 3 hr. PR: Math. 18 or consent. Hydraulic control circuits and design practice, includes components and elements, hydraulic fluid properties, characteristics of control components, feedback control approach and a semester problem of a complete circuit design. 3 hr. rec.
491. *Advanced Study*. I, II, S. 1-6 hr. PR: Consent. Investigation in advanced subjects which are not covered in regularly scheduled courses. Study may be independent or through specially scheduled lectures.
496. *Graduate Seminar*. I, II. 1 hr. PR: Consent. It is anticipated that each graduate student will present at least one seminar to the assembled faculty and graduate student body of his program.
497. *Research*. I, II, S. 1-15 hr.
498. *Thesis*. I, II, S. 2-4 hr. PR: Consent.
499. *Graduate Colloquium*. I, II, S. 1-6 hr. PR: Consent. For graduate students not seeking course work credit but who wish to meet residence requirements, use the University's facilities, and participate in its academic and cultural programs.

(See additional graduate-level engineering courses listed under "Courses of Instruction for General Engineering," page 183.)

CHEMICAL ENGINEERING

Master of Science in Chemical Engineering

Master of Science in Engineering

Students must comply with the rules and regulations as outlined in general requirements for graduate work in the College of Engineering. The master's degree programs, as outlined in "A Guide to the Graduate Program in Engineering," are offered and administered by the Department of Chemical Engineering.

Normally all M.S. degree candidates are required to perform research and will follow a planned program which conforms to either of the following outlines:

1. A minimum of 30 semester credit hours, not more than 6 of which are in research leading to an acceptable thesis.
2. A minimum of 33 semester credit hours, not more than 3 of which are in research leading to an acceptable problem report.

Admission to the M.S.Ch.E. program is restricted to those holding a baccalaureate degree in chemical engineering or its equivalent. In unusual cases the faculty will consider a student petition to take a 36-hour design-oriented chemical engineering practice program.

The M.S.E. program is available to students holding baccalaureate degrees in other fields of engineering and the physical sciences who wish to pursue a broad interdisciplinary program relevant to the major graduate areas administered by the department.

Courses. The adviser, in conjunction with an advisory and examining committee to be assigned to each student, will be responsible for following departmental guidelines to determine specific courses appropriate to the student's program. These departmental guidelines are available on request.

Examination. A candidate shall be required to pass examinations which may be written, or oral, or both, covering both course material and the thesis or problem report, depending upon the program selected.

Doctor of Philosophy

A candidate for the degree of Doctor of Philosophy in the Interdisciplinary Ph.D. program must comply with the rules and regulations as outlined in "A Guide to the Graduate Program in Engineering" and the Graduate School, and any specific regulations required by the Department of Chemical Engineering. A program with a major in chemical engineering, designed to meet the needs and objectives of each student, will be developed in consultation with the student's adviser and advisory and examining committee.

The research work for a doctoral dissertation should show a high order of originality on the part of the student and must offer an original contribution to the field of engineering science. It must have good literary form and style, and must give a thorough survey of the prior art with acceptable standards of documentation. Upon completion of the dissertation, the candidate will be required to submit to an oral defense. This examination will be designed to establish the candidate's logic, critical ability, and reasoning power, and will be based upon the field covered by the dissertation.

Chemical Engineering

Ch.E.

- 224. *Process Development*. 3 hr. PR: Chem. 134, 144, Ch.E. 111 and 143, or consent. Coal conversion process systems from the modified unit operations-unit process concept. Thermodynamics and kinetics in evaluation of system requirements and performance. 3 hr. rec.
- 231. *Mathematical Methods in Chemical Engineering*. 3 hr. PR: Math. 18. Classification and solution of mathematical problems important in chemical engineering. Treatment and interpretation of engineering data. Analytical methods for ordinary and partial differential equations including orthogonal functions and integral transforms. 3 hr. rec.
- 251. *Metallurgical Engineering*. 3 hr. PR: Physics 12. Principles of production of metals and alloys, plastic deformation of metals, corrosion, and metal failure. 3 hr. rec.
- 253. *Ceramic Engineering I*. 3 hr. PR: Physics 12. Characterization of ceramic systems. Study of internal structure and structure sensitive properties; liquid and solid solutions; rheology; mechanical, thermodynamic, chemical, optical, and electrical properties. 3 hr. rec. (*Course will not be offered in 1978-79.*)
- 258. *Polymers and Polymer Technology*. 3 hr. PR or Conc.: Chem. 134. Polymers and their handling. Properties of macromolecules as influenced by molecular weight, polymerization methods, plastics technology, polymer engineering. 3 hr. rec.
- 270. *Strategy of Process Engineering*. 3 hr. PR: Ch.E. 111 or consent. Latest theories of process design and process optimization, proven through regular use by practicing engineers, are applied to the major problems of process engineering. 3 hr. rec. (*Course will not be offered in 1978-79.*)
- 280. *Chemical Engineering Problems*. 1-6 hr. For juniors, seniors, and graduate students. May be used to correct deficiencies preparatory to or following courses such as Ch.E. 170 and 171, or for students in other disciplines desiring to take only a portion of a course.
- 290. *Introduction to Nuclear Engineering*. 3 hr. PR: Junior standing. Introduction to fundamental principles and applications of nuclear technology in science and engineering fields. Studies of nuclear fission and the design and operation of nuclear reactor systems; uses of radioisotopes as power sources and in materials processing, testing, and medicine; health physics and radiation detection and shielding.

301. *Transport Phenomena*. 3 hr. PR or Conc.: Ch.E. 231, or equiv. Introduction to equations of change (heat, mass and momentum transfer) with a differential balance approach. Use in Newtonian flow, turbulent flow, mass and energy transfer, radiation, convection. Estimation of transport coefficients. 3 hr. rec.
307. *Distillation*. 2-5 hr. PR: Math. 18 and consent. Vaporization principles of separation of liquid mixtures, stream, batch, continuous, azeotropic, extractive, and molecular distillation. 3 hr. rec., 0-6 hr. lab. (*Course will not be offered in 1978-79.*)
323. *Advanced Process Development*. 3 hr. PR: Consent. Extended and generalized unit process and operation concepts; specialized synthetic methods; reaction mechanisms and their effects on equipment design and performance; properties, their evaluation, prediction and marketability; industrial toxicology and plant safety. 3 hr. rec.
330. *Process Dynamics and Control*. 3 hr. PR: Consent. Dynamic response of processes and control instruments. Use of Laplace transforms and frequency response methods in analysis of control systems. Application of control systems in chemical reactors, distillation, and heat transfer operations. Introduction to non-linear systems. 3 hr. rec.
344. *Thermodynamics*. 3 hr. PR: Consent. Logical development of thermodynamic principles. These are applied to selected topics including development and application of the phase rule, physical and chemical equilibria in complex systems, and non-ideal solutions. Introduction to non-equilibrium thermodynamics. 3 hr. rec.
345. *Chemical Reaction Engineering*. 3 hr. PR: Consent. Homogeneous reactions, batch and flow reactors, ideal reactors, macro and micro mixing, non-ideal flow reactors, heterogeneous reaction systems, catalytic and non-catalytic reactions, reactor stability analysis, reactor optimization. 3 hr. rec.
358. *Polymer Processing*. 3 hr. PR: Chem. 134 or consent. Analytical description of rheology, molding, extrusion, bonding, polymer modification operations, physical properties. 3 hr. rec.
370. *Process Equipment Design I*. 3 hr. PR: Ch.E. 301 or consent. Design, sizing, optimization, and cost estimation of equipment used for heat transfer, emphasis on design techniques, computer design techniques discussed where applicable.
371. *Process Equipment Design. II*. 3 hr. PR: Ch.E. 301 or consent. Design and selection of separation processes including crystallization, leaching, extraction, distillation, absorption, filtration, membrane, and diffusional separation processes. Similarities between separation processes based on mode of operation are emphasized. 3 hr. rec.
390. *Nuclear Reactor Systems I*. 3 hr. PR: Consent. Intended as a first course for graduate students in the area of power reactor systems analysis and design. Includes topics such as neutron interactions with reactor materials, fission, reactor physics, reactor heat generation and removal, and thermal reactor core design.
391. *Nuclear Reactor Systems II*. 3 hr. PR: Ch.E. 390. Continuation of Ch.E. 390. Reactor kinetics, nuclear power economics, and case studies and analyses of the following reactor systems: pressurized-water, boiling-water, fast breeder, and gas-cooled power plants.
392. *Interaction of Radiation and Matter*. 1-3 hr. PR: Consent. Types of radiation, energy deposition by radiation, experimental instrumentation, formation and reactions of radiation-chemical species. 1-3 hr. rec. (*Course will not be offered in 1978-79.*)
400. *Chemical Engineering Seminar*. 1-6 hr. Fluidization, bioengineering, transport phenomena for biological systems, air and water pollution abatement, fast-reaction kinetics, radiation, nuclear power engineering, and direct energy conversion.
402. *Advanced Fluid Dynamics*. 3 hr. PR: Consent. Analysis of flow of fluids and transport of momentum and mechanical energy. Differential equations of fluid flow; potential flow, flow in porous media, laminar boundary layer theory, and non-Newtonian fluids. 3 hr. rec.

404. *Advanced Heat Transfer*. 3 hr. PR: Consent. Theory of transport of thermal energy in solids and fluids as well as radiative transfer. Steady and transient conduction; heat transfer to flowing fluids; evaporation; boiling and condensation; packed and fluid bed heat transfer. 3 hr. rec.
406. *Advanced Mass Transfer*. 3 hr. PR: Consent. Theory of diffusion, interphase mass transfer theory, turbulent transport, simultaneous mass and heat transfer, mass transfer with chemical reaction, high mass transfer rates, multicomponent macroscopic balances. 3 hr. rec.
432. *Optimization of Chemical Engineering Systems*. 3 hr. PR: Consent. Optimization in engineering design, unconstrained optimization and differential calculus equality constraints optimization, search technique, maximum principles, geometric and dynamic programming, linear and non-linear programming, calculus of variations. 3 hr. rec.
446. *Catalysis*. 3 hr. PR: Ch.E. 345 or consent. Physical and chemical properties of catalytic solids, nature and theories of absorption, thermodynamics of catalysis, theories of mass and energy transport, theoretical and experimental reaction rates, reactor design and optimization. 3 hr. rec.
447. *Non-Catalytic Solid-Fluid Reactions*. 3 hr. PR: Ch.E. 345 or consent. Reaction models, pseudo-steady state approximation, effectiveness factor, transport and chemical reaction properties, geometric, thermal and transitional instabilities, simultaneous multiple reactions, selectivities in fixed, moving and fluidized bed reactor design. 3 hr. rec.
472. *Process Design and Development I*. 3 hr. PR: Ch.E. 301 or consent. Process development, from inception to the final design, emphasis on economic and cost estimating at various stages of process development, relationship of research and development, engineering design and production, process optimization and computer design techniques. 3 hr. rec.
473. *Process Design and Development II*. 3 hr. PR: Ch.E. 472 or consent. Practice of process design using case studies method either with class or student teams, concurrent lectures on relevant subjects taught by specialists using team teaching concepts. 3 hr. rec.
480. *Advanced Independent Study*. 1-6 hr. PR: Consent. Designed to increase the depth of study in a specialized area of chemical engineering.
497. *Research*. 1-15 hr.

(See additional graduate-level engineering courses listed under "Courses of Instruction in General Engineering," page 183.)

CIVIL ENGINEERING

Master of Science in Civil Engineering

Master of Science in Engineering

Students must comply with rules and regulations as outlined in general requirements for graduate work in "A Guide to the Graduate Program in Engineering." Each candidate will, with the approval and at the discretion of the graduate committee, follow a planned program which must conform to one of the following outlines:

1. A minimum of 30 semester credit hours, not more than 6 of which are in research leading to an acceptable thesis.
2. A minimum of 33 semester credit hours, not more than 3 of which are in research leading to an acceptable problem report.

3. A minimum of 36 semester credit hours, with no thesis or problem report required.

Courses. No rigid curriculum is prescribed for the degrees of Master of Science in Civil Engineering and Master of Science in Engineering. Graduate level work in mathematics, mechanics, or other appropriate areas of science is customary; however, at least 15 semester hours credit should normally be selected from graduate civil engineering courses.

Thesis or Problem Report. A thesis or problem report is normally required of all candidates. While required credit in research (C.E. 497) is devoted to the thesis or report preparation, the thesis or problem report is not automatically approved after the required number of semester hours of research work have been completed. The thesis or problem report must conform with the general requirements of the Graduate School and with any additional requirements established by the Department of Civil Engineering.

Final Examination. A candidate shall be required to pass an examination which may be written, oral, or both, to be administered by the student's advisory and examining committee. The examination shall cover course material and the thesis or problem report, depending upon the program followed.

Master of Science in Civil Engineering

Approval for the M.S.C.E. degree is restricted to those holding a baccalaureate degree in civil engineering.

Master of Science in Engineering

The M.S.E. program is available to the students approved for the graduate program who do not possess a baccalaureate degree in civil engineering. Students entering this graduate program must complete appropriate undergraduate work as specified by departmental regulations.

Doctor of Philosophy

The Doctor of Philosophy degree is administered through the College of Engineering Interdisciplinary Program. A candidate for the degree of Doctor of Philosophy must comply with the rules and regulations as outlined in general requirements for graduate work in "A Guide to the Graduate Program in Engineering." A program designed to meet the needs and objectives of each student will be developed in consultation with the student's committee.

The research work for the doctoral dissertation must show a high degree of originality on the part of the student and must constitute an original contribution to the art and science of civil engineering. The dissertation must have good literary form and style and must present a thorough review of the prior study in the subject with acceptable standards of documentation. The candidate is required to take a final oral examination upon completion of the dissertation. This examination is designed to permit the candidate to demonstrate ability to present and defend the work orally in a logical manner.

Civil Engineering

C.E.

212. *Concrete and Aggregates.* 3 hr. PR: C.E. 110 or consent. Considerations and methods for the design of concrete mixes. Properties of portland cement and aggregates and

their influence on the design and performance of concrete mixtures. Test methods for concrete and aggregates and the significance of these tests. 2 hr. rec., 3 hr. lab.

213. *Construction Methods*. 3 hr. PR: C.E. Senior standing. Study of construction methods, equipment, and administration with particular emphasis on the influence of new technology developments. 3 hr. rec.
222. *Open Channel Flow*. 3 hr. PR: C.E. 120. Hydraulic problems associated with natural waterways, man-made waterways, and design of hydraulic structures of open channels. 3 hr. rec.
232. *Principles of Transportation Engineering*. 3 hr. PR: C.E. 131 or consent. Basic approach to the problem of integrated transportation systems from standpoint of assembly, haul, and distribution means. Analysis of the characteristics of the transport equipment and traveled way. Power requirements, speed, stopping, capacity costs, economics of location and route selection. Future technological developments and innovations. 3 hr. rec.
235. *Railway Engineering*. 3 hr. PR: C.E. 101. Development and importance of the railroad industry. Principles of location, construction, operation, and maintenance. 3 hr. rec.
251. *Public Health Engineering*. 3 hr. PR: C.E. 146 or 147 or consent. Engineering aspects involved in control of the environment for the protection of health and promotion of comfort of man. Communicable disease control, milk and food sanitation, air pollution, refuse disposal, industrial hygiene, and radiological health hazards. 3 hr. rec.
252. *Water Resources Engineering*. 3 hr. PR: C.E. 120. Design of water-resources systems. The interrelationship between economic objectives, engineering analysis, and government agencies. 3 hr. rec.
260. *Structural Analysis II*. 3 hr. PR: C.E. 160. Fundamental theory of statically indeterminate structures. General theory of continuity and iterative and energy methods applied to the analysis of indeterminate beams and frames. 3 hr. rec.
270. *Structural Design I*. 3 hr. PR: C.E. 169 or consent. Reinforced concrete members. Design considerations for concrete bridges and buildings. 2 hr. rec., 3 hr. lab.
271. *Structural Design II*. 3 hr. PR: C.E. 169 or consent. Design of steel bridge and building structures. Welded, riveted, and bolted connections; simple and moment-resistant connections; cost estimates. 2 hr. rec., 3 hr. lab.
281. *Foundations Engineering*. 3 hr. PR: C.E. 180. Soils exploration and the design and analysis of engineering foundations. Emphasis on earth pressures and design of retaining walls, studies of bracing systems, and the elements of shallow and deep foundations for bridges and buildings. Movement of water through soil structures and control of water in excavations. 3 hr. rec.
291. *Comprehensive Project for Civil Engineers*. 3 hr. PR: Senior standing or consent. Application of civil engineering principles, through group studies, to develop a solution for a comprehensive engineering problem. Consideration given to a problem involving all aspects of civil engineering. 2 hr. rec., 3 hr. lab.
307. *Photogrammetry*. 3 hr. PR: C.E. 101. Geometry and interpretation of aerial photography; flight planning; radial-line control; principles of stereoscopy; plotting instruments. 2 hr. rec., 3 hr. lab.
308. *Geodesy*. 3 hr. PR: C.E. 101. Precise base line measurements, triangulation and leveling, geodetic astronomy; figure of the earth, map projections; rectangular coordinate systems; least squares adjustment; gravity. 3 hr. rec.
310. *Bituminous Materials and Mixtures*. 3 hr. PR: C.E. 110 or consent. Manufacture, testing, and nature of bituminous materials. Principles of the design and behavior of bituminous mixtures including the influence of aggregates, temperature, and other variables on the design for stability and durability. Significance of test methods and specifications. Construction practice. 2 hr. rec., 3 hr. lab.

311. *Pavement Design*. 3 hr. PR: C.E. 110, 180. Effects of traffic, soil, environment, and loads on the design and behavior of pavement systems. Design of flexible and rigid pavements, bases, and sub-bases. Consideration of drainage and climate. Pavement performance and performance surveys. 3 hr. rec.
332. *Airport Planning and Design*. 3 hr. PR: C.E. 131 or consent. Airport financing, air travel demand modeling, aircraft trends, air traffic control, site selection, ground access, noise control, geometric design, pavement design, and terminal facilities. 3 hr. rec.
333. *Geometric Design of Highways*. 3 hr. PR: Consent. The theory and practice of geometric design of modern highways. Horizontal and vertical alignment, cross-slope, design speed, sight distances, interchanges, and intersections. Critical analysis of design specifications. 2 hr. rec., 3 hr. lab.
334. *Introduction to Traffic Engineering*. 3 hr. PR: C.E. 131 or consent. The purpose, scope, and methods of traffic engineering. Emphasis on the three basic elements of the transportation system, i.e. the human, vehicle, and roadway. Characteristics of each element and interactions between the elements. Laboratory devoted to conducting simple traffic studies, solving practical problems, and designing traffic facilities. 2 hr. rec., 3 hr. lab.
345. *Properties of Air Pollutants*. 3 hr. PR: Consent. Physical, chemical, biological, and social behavioral properties of dusts, droplets, and gases in the atmosphere. Air pollutant sampling and analysis. Planning and operating air pollution surveys. 2 hr. rec., 3 hr. lab.
349. *Solid Waste Disposal*. 3 hr. PR: Consent. Study of traditional patterns and problems of solid waste storage, transport, and disposal. Examination of various engineering alternatives with appropriate consideration for air and water pollution control and land reclamation. Analytical approaches to recover and reuse of materials. 2 hr. rec., 3 hr. lab.
350. *Sanitary Chemistry and Biology*. 3 hr. PR: C.E. 147 or consent. Study of physical and chemical properties of water. Theory and methods of chemical analysis of water, sewage, and industrial wastes. Biological aspects of stream pollution problems. 2 hr. rec., 3 hr. lab.
356. *Principles of Biological Waste Treatment*. 3 hr. PR: C.E. 350 or consent. Examination of biological systems used in waste treatment as to ecology and function. Models used to describe system behavior are developed. Laboratory experiments performed to understand operation and design of treatment plants. 2 hr. rec., 3 hr. lab.
359. *Basic Radiological Health*. 3 hr. PR: Consent. Fundamentals theory and terminology. Environmental and occupational hazards in the nuclear field. Radioactive waste disposal. Laboratory measurements of radioactivity. 2 hr. rec., 3 hr. lab.
361. *Statically Indeterminate Structures*. 3 hr. PR: C.E. 260 or consent. Advanced topics in indeterminate structural analysis for trusses, nonprismatic members and frames. 3 hr. rec.
363. *Introduction to Structural Dynamics*. 3 hr. PR: Math. 18 and C.E. 361 or 460. General theory for dynamic response of systems having one or several degrees of freedom. Emphasis on the application of dynamic response theory to structural design. 3 hr. rec.
372. *Plastic Design of Steel Structures*. 3 hr. PR: C.E. 270, 271, or consent. The fundamental concepts of inelastic behavior in steel. Analysis of structures for ultimate load. The influence of axial forces, shear forces, and local buckling on the plastic moment. Study of structural connections and deflections. Steel structures design. 3 hr. rec.
373. *Prestressed Concrete*. 3 hr. PR: C.E. 270 or consent. The analysis and design of determinate and indeterminate prestressed beams and frames. 3 hr. rec.

374. *Timber Design*. 3 hr. PR: C.E. 160 or consent. Emphasis on fundamentals of modern timber design and analysis. Topics include a review of wood properties, design of beams, columns, arches, trusses, and pole structures using dimensional lumber, glue-laminated and plywood components. Detailed study of connections using nails, shear connectors, and adhesives. 3 hr. rec.
380. *Soil Properties and Behavior*. 3 hr. PR: C.E. 180 or consent. Soil mineralogy and the physico-chemical properties of soils and their application to an understanding of the behavior of soils. A detailed review of the basic and classical theories of permeability, consolidation, shear strength, and compaction. Prediction of engineering behavior of soils in light of physico-chemical concepts. 3 hr. rec.
381. *Soil Testing*. 3 hr. PR: C.E. 180 or consent. Complements and expands the material covered in C.E. 380 from an experimental standpoint. Experimental studies conducted to demonstrate empirical and theoretical principles. Emphasis on the proper interpretation of experimental results and application of such results to practical problems. 1 hr. rec., 6 hr. lab.
385. *Airphoto Interpretation*. 3 hr. Study of techniques for obtaining qualitative information concerning extent, type, and engineering characteristics of surficial materials. Use of airphoto interpretation for evaluation of engineering problems encountered in design and location of engineering facilities. 3 hr. rec.
421. *Hydraulic Structures*. 3 hr. PR: E.E. 120 or consent. Hydraulic analysis and design of engineering structures such as reservoirs, dams, spillways, gates, and outlet works. Study of hydraulic machinery, irrigation, hydroelectric power, drainage, and flood control. 3 hr. rec.
422. *Surface and Subsurface Drainage*. 3 hr. PR: Consent. Nature and requirements of drainage studies and drainage design as they pertain to transportation facilities. Emphasis on the theory of drainage design and a critical analysis of drainage practice. 3 hr. rec.
430. *Highway Laws*. 3 hr. PR: Consent. Highway laws with emphasis on aspects particularly related to planning functions, such as reservation of right-of-way, access control, eminent domain, systems classification, and the basis for the existence and operation of various planning agencies. 3 hr. rec.
431. *Traffic Flow Theory*. 3 hr. PR: I.E. 213 and C.E. 438 or consent. Basic concepts of quantitative analysis of traffic systems. Probability theory, queuing theory, pedestrian and traffic delay at traffic signals, turning at intersections, parking problems, merging traffic on two-lane roads, simulation of traffic problems. 3 hr. rec. (Also listed as I.E. 431.)
432. *Highway Economics and Administration*. 3 hr. PR: Consent. Methods of financing highways, including federal participation. Establishing allocation of highway cost and determination of economic justification of routes. Analysis of highway administrative organizations. 3 hr. rec.
434. *Urban Problems*. 3 hr. PR: Consent. Problems of transportation in the urban area as they relate to general development of the city. Emphasis on the engineer in planning for urban transportation and relationship of engineer to the city planner and city administration. 3 hr. rec.
436. *Highway Planning I*. 3 hr. PR: Consent. Planning programs and methods including highway needs studies, priority rating systems, and programming methods. Consideration of traffic assignment and forecasting techniques. Devoted primarily to rural route problems. Case history method of study utilized. 3 hr. rec.
437. *Highway Planning II*. 3 hr. PR: C.E. 436. Continuation of C.E. 436 with special attention to urban locations and planning. 3 hr. rec.
438. *Traffic Engineering Characteristics*. 3 hr. PR: C.E. 131 or consent. Analysis of basic characteristics of drivers, vehicles, and roadway that affect the performance of road

systems. Studies of volumes, speeds, delays, intersections, interchanges, capacity, and accidents will be considered. Techniques of traffic engineering measurements, investigations, and data analysis, including laboratory practice. 2 hr. rec., 3 hr. lab.

439. *Traffic Engineering Operations*. 3 hr. PR: C.E. 438. Theory and practice of application of traffic engineering regulations, traffic flow theory, design and use of traffic control devices and signal systems. Traffic administration and parking control. 3 hr. rec.
446. *Air Pollution Control Engineering*. 3 hr. PR: C.E. 345 or consent. Study of engineering alternatives in achieving various degrees of air pollution control. Factors considered in selection and specification of dust and gas collectors and convertors for various types of operations, and use of alternate process methods and process materials. 2 hr. rec., 3 hr. lab.
447. *Air Pollution Control Standards*. 3 hr. PR: C.E. 446 or consent. Comparative study of technical, economical, and social factors used in developing and establishing air pollution standards, criteria, and control limitations. Relationships between process design specifications, pollutant emission limitations, ambient air pollution effects on people and objects, air quality standards, and emission performance limitations. 2 hr. rec., 3 hr. lab.
448. *Air Pollution Control Programs*. 3 hr. PR: C.E. 446 or consent. Examination of air pollution control programs of industries and government. Rationales and patterns of organization structure and operating administrative factors, including intra-office and inter-office and other group relationships. Significance of relationship with land use planning, solid waste, fire prevention, water pollution control, building inspection, and economic development agencies. 3 hr. rec.
452. *Water Treatment Theory*. 3 hr. PR: C.E. 350. Theory of various procedures and techniques utilized in treatment of water for municipal and industrial use. Review of water quality criteria. Design of water purification facilities. 2 hr. rec., 3 hr. lab.
454. *Industrial and Advanced Waste Treatment*. 3 hr. PR or Conc.: C.E. 350 or consent. Basic physical and chemical operations used in industrial and advanced waste treatment; applications for waste water reclamation and reuse; study of industrial wastes from standpoint of process, source, and treatment. 3 hr. rec.
455. *Municipal and Industrial Design of Solid Wastes Disposal Operations*. 3 hr. PR: C.E. 349 or consent. Design criteria of existing methods and equipment for disposal of solid wastes generated by industry and municipalities; on-site preparation; volume and density modification; and reclamation of marketable materials. Process, source, treatment, and final disposal with considerations of waste reclamation and reuse of available energy. 3 hr. rec.
457. *Hydraulics of Sanitary Engineering Works*. 3 hr. PR: C.E. 120. Techniques of population growth estimation, rainfall and runoff analysis, flood flow, and ground water data to the design of sanitary works. Designs of water distribution and sewerage systems. 2 hr. rec., 3 hr. lab.
458. *Design of Sanitary Works*. 3 hr. PR: C.E. 120. Water supply and waste water disposal problems. Design of treatment facilities. 2 hr. rec., 3 hr. lab.
460. *Statically Indeterminate Structures*. 3 hr. PR: C.E. 260 or consent. General theory of continuity, iterative, and classical methods of analysis of skeletal structures with emphasis on the influence coefficient method. 3 hr. rec.
461. *Bridge Engineering*. 3 hr. PR: C.E. 361 or consent. Statically indeterminate trusses, continuous trusses; steel and concrete arches; long-span and suspension bridges; secondary stresses. 3 hr. rec.
462. *Numerical Methods of Structural Analysis*. 3 hr. PR: C.E. 361 or 460. Methods of successive approximations and numerical procedures for solution of structural problems. Application of these procedures to analysis of bridges and buildings. 3 hr. rec.

470. *Behavior of Steel Members*. 3 hr. PR: C.E. 271 or consent. Elastic behavior of steel members subjected to axial load, bending, and torsion. Elastic and inelastic response of beams, columns, and beam-columns to load and the resulting design implications. Comparison with standard steel codes and specifications. 3 hr. rec.
471. *Light Gage Metal Design*. 3 hr. PR: C.E. 260, 271, or consent. Analysis and design of light gage metal systems; flexural and compression members design; investigations into post buckling strength and optimum weight systems. 3 hr. rec.
473. *Structural Design for Dynamic Loads*. 3 hr. PR: C.E. 363 or consent. Nature of dynamic loading caused by earthquakes and nuclear weapons blasts; nature of dynamic resistance of structural elements and structural systems; criteria for design of blast-resistant and earthquake resistant structures; simplified and approximate design methods. 3 hr. rec.
474. *Behavior and Advanced Design of Timber Structures*. 3 hr. PR: C.E. 260, 374, Wood Sci. 261 or consent. Study of the behavior and analysis of structural systems and components fabricated from timber. Behavior of timber members subjected to bending, shear, and compression, impact, and vibration. Evaluation of the time dependent characteristics of timber members under load. Analysis and design of special timber structures including lamella roofs, stressed skin and prestressed members, and space frames. 3 hr. rec.
475. *Analysis and Design of Multistory Structures*. 3-6 hr. PR: C.E. 270, 271. Theories of action of beams, slabs, and columns of reinforced concrete or steel; review of standard codes and specifications and their influence on design. 3 hr. rec.
476. *Behavior of Reinforced Concrete Members*. 3 hr. PR: C.E. 270 or consent. Studies of the actual behavior and strength of reinforced concrete members by critically reviewing experimental and analytical investigations. Beams subjected to pure flexure; columns subjected to axial compression; combined flexure and compression; combined flexure, shear, and bond. 3 hr. rec.
477. *Behavior of Reinforced Concrete Structures*. 3 hr. PR: C.E. 476. Continuation of C.E. 476. Studies of behavior and strength of statically indeterminate reinforced concrete structures. Comparison with reinforced concrete codes and specifications. 3 hr. rec.
478. *Thin Shell Roof Structures I*. 3 hr. PR: Math. 113, C.E. 361 or consent. Development and solution of the fundamental elastic equations for barrel vault roofs using matrix algebra. Effects of edge members upon the strength and stiffness of barrel vault roofs. Design of simple shell structures. 3 hr. rec.
479. *Thin Shell Roof Structures II*. 3 hr. PR: C.E. 478 or consent. Continuation of C.E. 478. Analysis of multiple cylindrical shells using the theory of elasticity and matrix algebra. Ultimate load and variational methods in shell analysis. Design and analysis of doubly curved shells. 3 hr. rec.
480. *Geotechnic*. 3 hr. PR: Consent. A presentation of a unified approach to the various aspects of soil formation and the influence of the formative factors on the nature of soils and their use as engineering materials. Presented cooperatively with the Department of Agronomy and the Department of Geology. 3 hr. rec.
482. *Foundation Engineering*. 3 hr. PR: C.E. 281, 380, or consent. Study of soil-structure interaction. Application of principles of geotechnical engineering and structural analysis and design to the design of spread footings, pile foundations, retaining wall, and bracing systems for deep excavations.
483. *Earthwork Design*. 3 hr. PR: C.E. 380 or consent. Application of the principles of theoretical soil mechanics to the design of embankments of earth and rock. Detailed attention is given to compaction methods and equipment, stability of natural and man-made slopes, embankment foundation stability. 3 hr. rec.

484. *Groundwater and Seepage*. 3 hr. PR: Consent. Flow of groundwater through soils and its application to the design of highways and dams and to construction operations. Particular emphasis is placed on the analytical solution of seepage problems. The classical flow net techniques for solving seepage problems also are given detailed consideration. 3 hr. rec.
486. *Soil Dynamics*. 3 hr. PR: C.E. 380 and consent. Fundamental behavior of soils subjected to dynamic loads produced by explosion effects, earthquake effects, and foundation vibrations. Particular emphasis is placed on the stress-strain-time behavior of soils for conditions of rapid stress or change. Consideration is given to wave propagation resulting from ground motions. Theories of vibration of a mass resting on an elastic half-space are applied to foundation vibration problems. 3 hr. rec.
490. *Teaching Practicum*. 1-3 hr. PR: Consent. Supervised practices in college teaching of civil engineering.
- ✓ 491. *Advanced Study*. 1-6 hr. PR: Consent. Investigation in advanced subjects which are not covered in regularly scheduled courses. Study may be independent or through specially scheduled lectures.
495. *Seminar*. 1-2 hr. PR: Consent. Studies and group discussion of structural fluid mechanics, surveying, transportation, soil mechanics and foundations, and sanitary problems.
496. *Graduate Seminar*. 1 hr. PR: Consent. Each graduate student will present at least one seminar to the assembled faculty and graduate student body of his program.
- ✓ 497. *Research*. 1-15 hr.
498. *Thesis*. 2-4 hr. PR: Consent.
499. *Graduate Colloquium*. 1-6 hr. PR: Consent. For graduate students not seeking coursework credit but who wish to meet residence requirements, use the University's facilities, and participate in its academic and cultural program.

(See additional graduate-level engineering courses listed under "Courses of Instruction for General Engineering," page 183.)

ELECTRICAL ENGINEERING

The Department of Electrical Engineering is authorized to admit students to the degree programs of the Master of Science in Electrical Engineering (M.S.E.E.) and the Master of Science in Engineering (M.S.E.). It also participates in the College of Engineering interdisciplinary Ph.D. degree program. Graduate students in the Department of Electrical Engineering must comply with the rules of the Graduate School and with the requirements specified in "A Guide to the Graduate Program in Engineering."

Master of Science in Electrical Engineering

Master of Science in Engineering

Course Requirements. All M.S. degree candidates will be required to meet the following minimum requirements:

1. At least two courses selected from the following:
E.E. 315, 325, 333, 340, 350, 364, and 370 6 hr. (min.)
2. Selected courses offered outside the Department of Electrical Engineering to provide analytical techniques supporting the student's graduate program. (For example: Mathematics, Statistics, etc.) 6 hr. (min.)

Each M.S. degree candidate will be required to make an oral presentation of the thesis or problem research to a graduate seminar which will be given near the conclusion of the student's research but before scheduling the final examination.

Students with deficiencies in their undergraduate program may be required to take some electrical engineering or mathematics courses as prerequisites for graduate courses. These deficiencies are usually noted as a condition for admission. However, they may also be specified as a result of the entrance interview. If these courses are normally required for the B.S.E.E. at WVU, they will not be accepted for credit in an M.S. degree program unless specifically approved by the student's Advisory and Examining Committee.

Entrance Interview. All students beginning graduate study in electrical engineering will be given an entrance interview. The interview determines if a student is adequately prepared to pursue a graduate degree program and aids the faculty in advising the student. As a result of the interview, the student and the committee should prepare a mutually acceptable preliminary plan of study.

Thesis. Normally a thesis is required of all M.S. candidates in electrical engineering. Approval by the Advisory and Examining Committee is necessary before the thesis will be accepted. The thesis must be presented in a form that conforms to general requirements of the Graduate School, and should conform to additional thesis requirements of the department.

Final Examination. Each candidate for the M.S. degree shall pass a final examination administered by the student's Advisory and Examining Committee. This examination may be written or oral, or both, and shall cover the course materials and defense of the thesis or report when applicable.

Master of Science in Electrical Engineering

Students may be admitted to the M.S.E.E. program if they hold a baccalaureate degree in electrical engineering or its equivalent. Students who lack this requirement may either make up the necessary undergraduate course work or may apply for admission to the M.S.E.E. program with emphasis in electrical engineering.

Master of Science in Engineering

The M.S.E. program is available to students who are interested in graduate work in electrical engineering but who hold a baccalaureate degree from another discipline. Students with a baccalaureate degree from another field of engineering or from one of the sciences should contact the Department of Electrical Engineering for further information. In general, a student in the M.S.E. program will not be asked to complete all of the requirements equivalent to the B.S.E.E. degree. However, all graduate students will be required to meet the prerequisites for each course taken for credit.

Doctor of Philosophy

Students interested in electrical engineering and who wish to pursue the Ph.D. degree should contact the department for information about the interdisciplinary Ph.D. program in engineering. While it is possible for a student with only a B.S. degree to enroll directly in the Ph.D. program, it is usually advisable for the student to earn an M.S. degree first. Students in the Ph.D. program must comply with the rules and regulations outlined in the general requirements for graduate work in engineering and the interdisciplinary Ph.D. degree as stated in "A Guide to the Graduate Program in Engineering."

A typical Ph.D. program will take between three and four years beyond the baccalaureate degree. The courses chosen for a given student's program are selected to accomplish three objectives: (1) develop the student's expertise in the student's area of interest, (2) strengthen the student's knowledge of other areas that will support the student's research endeavors, and (3) satisfy the Interdisciplinary curriculum requirements of the College. A possible outline for a Ph.D. program is given below:

First Year — M.S. degree

Second Year —

- (a) An approved plan of study consisting mainly of courses in the 300 and 400 series.
- (b) Admission to candidacy for the Ph.D. degree
 - (1) Pass written and oral comprehensive examinations
 - (2) Successfully defend research proposal
 - (3) Complete all program requirements set by his advisory and examining committee.

Third Year —

- (a) Complete research and write dissertation.
- (b) Defend dissertation in final examination.

The research work for the doctoral dissertation is expected to represent a significant contribution to engineering. It may entail a fundamental investigation into a specialized area or a broad and comprehensive system analysis or design. In either case, a high degree of creative effort and independence is required to meet the standards of acceptability.

Electrical Engineering

E.E.

- 200. *Seminar.* (Credit). PR: Senior standing. Special materials and projects.
- 201* *Electronics for Scientists.* 3 hr. PR: General physics and elementary calculus or consent. Special course for chemists, physicists, medical researchers, and other research workers having a limited background in electronics. Electrical and electronic fundamentals. Application of electronic instrumentation and electrical signal processing. (Not normally open to Engineering students.) 2 hr. rec., 3 hr. lab.
- 208. *Power Electronics.* 3 hr. PR: E.E. 130 and E.E. 154 (concurrently) or consent. Application of power semiconductor components and devices to power systems problems: power control, conditioning processing, and switching. Course supplemented by laboratory problems. 3 hr. rec.
- 216. *Fundamentals of Control Systems.* 3 hr. PR: E.E. 125. Fundamental concepts of feedback control system analysis; stability, and design in the frequency, complex variable, and time domains. Includes Nyquist, root locus and state variable concepts. Mitrovic's method and Chen's method. 3 hr. rec.
- 218. *Engineering Analysis and Design.* 3 hr. PR: E.E. 130, 154, 200. Application of the method of engineering analysis based upon fundamental physical laws, mathematics, and practical engineering consideration. Emphasis on the professional approach to analysis of engineering problems. 3 hr. rec.
- 230. *Electrical Power Distribution System.* 3 hr. PR: E.E. 131 or consent. General considerations; load characteristics; subtransmission and distribution substations; primary and secondary distribution; secondary network systems; distribution transformers; voltage regulation and application of capacitors; voltage fluctuations; protective device coordination. 3 hr. rec.

*Courses indicated will not usually apply for credit toward a graduate degree in Electrical Engineering.

231. *Electrical Power Systems I*. 3 hr. PR: E.E. 131 or consent. Analytical methods for steady-state performance of power systems. 3 hr. rec.
234. *Power System Stability*. 3 hr. PR: E.E. 231 or consent. Transient stability, acceleration equations, stability criteria. Two machine and multi-machine problem, solutions by digital analysis. Methods of improving stability. 3 hr. rec.
244. *Introduction to Antennas and Radiating Systems*. 3 hr. PR: E.E. 141 or consent. Radiation from current distributions, linear antennas, far field approximations, field equivalence theorems, aperture antennas, antenna arrays, patterns, and gain, and application to specific antenna types. 3 hr. rec.
245. *Microwave Circuits and Devices*. 3 hr. PR: E.E. 141. UHF transmission line theory, impedance matching techniques and charts, general circuit theory of one port and multiports for waveguiding systems, impedance and scattering matrices, waveguide circuit elements, microwave energy sources. Course will be supplemented by laboratory problems. 3 hr. rec.
252. *Electronics III*. 3 hr. PR: E.E. 154. Linear integrated circuit building blocks applied to such functions as amplification, controlled frequency response, analog-digital conversion, sampling, and waveform generation. 2 hr. rec., 3 hr. lab.
253. *Physical Electronics I*. 3 hr. PR: E.E. 150 or equiv. Properties of semiconductors and electrical conduction processes in solids. Applications of these principles in determining the characteristics of discrete electronic devices. Introduction to lasers and masers. 3 hr. rec.
257. *Transistor Circuits*. 3 hr. PR: E.E. 152 or equiv. Analysis and design of multistage transistor amplifiers. Methods of handling the interaction between stages. Gain and bandwidth of multistage low-pass and tuned amplifiers. Feedback amplifiers. 3 hr. rec.
264. *Introduction to Communication Systems*. 3 hr. PR: E.E. 126. Introduction to the first principles of communication system design. Analysis and comparison of standard analog and pulse modulation techniques relative to band-width, noise, threshold, and hardware constraints. Communication systems are treated as opposed to individual circuits and components of the system. 3 hr. rec.
271. *Logic of Digital Computers*. 3 hr. PR: Consent. An introduction to the design of digital networks and computers. Topics include: computer organization, number systems and representations, Boolean or switching algebra, logic design, minimization of logic, sequential networks and the design of digital subsystems. 3 hr. rec.
272. *Introduction to Computer Hardware Architecture*. 3 hr. PR: Consent. Introduction to basic digital systems and computer architecture. Definition of information storage concepts, central processor designs, and input/output concepts. Content addressable memories, microprogrammed control, addressing techniques, interrupts, and cycle stealing. 3 hr. rec.
275. *Pulse Techniques*. 3 hr. PR: E.E. 152. Introduction to the response of electrical networks to non-sinusoidal inputs, analysis of active networks with large signals and circuits and techniques used in pulse and digital equipment. Students use the University's computing facilities by solving problems using ECAP. No previous programming is needed. 2 hr. rec., 3 hr. lab.
278. *Analogue Computers*. 3 hr. PR: Math. 18. Theory and operation of analogue computers. Amplitude scaling and time scaling on the computer and application of computer to solution of differential equations. 3 hr. rec.
280. *Electrical Problems I*. 1-3 hr. For junior, senior, and graduate students.
312. *Feedback System Theory*. 3 hr. PR: E.E. 216, 325. Signal flow graphs; sensitivity; return difference; mathematical definition of feedback; effects of feedback; multiple loop systems; multivariate systems. 3 hr. rec.

315. *State Variable Analysis of Systems*. 3 hr. PR: Consent. Matrix theory and linear transformations as applied to linear control systems. The state-space on time-domain study of stability, controllability, observability, etc. 3 hr. rec.
316. *Synthesis of Feedback Systems I*. 3 hr. PR: E.E. 312, 364. Methods of direct synthesis and optimization of feedback systems; Wiener theory; Pontryagin's maximum principle; dynamic programming; adaptive feedback systems. 3 hr. rec.
325. *Advanced Linear Circuit Analysis*. 3 hr. PR: Consent. Systematic formulation of circuit equations. Use of operational techniques to find total solutions. Applications and characteristics of the Laplace and Fourier transforms, matrix algebra, complex variable theory and state variables are made to circuit analysis and elementary circuit synthesis. 3 hr. rec.
328. *Modern Network Synthesis*. 3 hr. PR: E.E. 325 or consent. Two-terminal network synthesis; Brune and Bott-Duffin synthesis; four-terminal networks; modern filter synthesis; Darlington synthesis, transfer-function synthesis; ladder and lattice synthesis; potential analogy and approximation problems. 3 hr. rec.
330. *Advanced Electrical Machinery*. 3 hr. PR: E.E. 131 or consent. Theory and modeling of synchronous machine, and their steady-state and transient analysis. 3 hr. rec.
331. *Electrical Power Systems II*. 3 hr. PR: E.E. 231 or consent. Electrical transients on power systems including traveling waves due to lightning and switching. Principles of lightning protection. 3 hr. rec.
333. *Application of Digital Computers to Power System Analysis*. 3 hr. PR: E.E. 231 or consent. Incidence and network matrices; algorithms for their formation; three-phase networks; short-circuit calculations; load-flow studies. 3 hr. rec.
340. *Electromagnetic Fields and Guided Waves I*. 3 hr. PR: E.E. 141 or equiv. Plane waves in dielectrics, conducting, and anisotropic media; polarization; radiation; duality; image theory; equivalence principle; Green's functions; integral equations; plane wave functions. 3 hr. rec.
350. *Electronic Circuits*. 3 hr. PR: E.E. 154 or equiv. Analysis and design of electronic circuits; low-pass and band-pass amplifiers, single-tuned and double-tuned stages, equal ripple and maximally flat responses. 3 hr. rec.
353. *Physical Electronics II*. 3 hr. PR: E.E. 154 or equiv. Semiconductor surfaces; surface states, space charge and the field effect. 3 hr. rec.
357. *Linear Integrated Circuits*. 3 hr. PR: E.E. 154 or equiv. Techniques of integrated circuit design and fabrication. Development of models descriptive of linear and nonlinear transistor operation. Design and analysis of high-frequency tuned, dc, and differential amplifiers. Primarily for students specializing in communication and electronics. 3 hr. rec.
358. *Integrated Logic Circuits*. 3 hr. PR: E.E. 154 or equiv. or consent. Techniques of integrated circuit design and fabrication. Development of transistor model for nonlinear operation. Design, analysis, and comparison of emitter-coupled, direct-coupled, diode-transistor, and transistor-transistor integrated logic circuits. Intended for students specializing in digital circuits. 3 hr. rec.
364. *Communication Theory*. 3 hr. PR: E.E. 264 or consent. Detailed study of probability theory and its use in describing random variables and stochastic processes. Emphasis on applications to problems in communication system design. 3 hr. rec.
366. *Information Theory I*. 3 hr. PR: E.E. 364. Probability concepts; theory of discrete systems; encoding; theory of continuous systems; systems with memory; the fundamental theorem of information theory. 3 hr. rec.
370. *Switching Circuit Theory I*. 3 hr. PR: E.E. 271 or equiv. The course presumes an understanding of the elements of Boolean or switching algebra. A study of both combi-

national and sequential switching circuits with emphasis on sequential networks. Advanced manual design and computer-aided-design techniques for single and multiple output combinational circuits are covered initially. Analysis and design of sequential circuits. Detection and prevention of undesired transient outputs. 3 hr. rec.

372. *Advanced Computer Architecture*. 3 hr. PR: E.E. 271 and 272 or consent. Formal tools for designing large digital systems are introduced; formal descriptive algebras such as ISP, PMS, AHPL, CDL, and others. An in-depth study of computer system designs including instruction design and data path design is given. 3 hr. rec.
373. *Design of Computer Arithmetic Circuits I*. 3 hr. PR: E.E. 271 or equiv. Detailed study of computer circuitry usable in performing binary arithmetic. Logic, circuitry, and engineering aspects of digital computer equipment design. Primary emphasis on design of high speed, parallel arithmetic units using the natural binary number system. Analysis of systems for representing negative numbers. Study of various means for obtaining high speed addition, subtraction, and multiplication. 3 hr. rec.
374. *Design of Computer Arithmetic Circuits II*. 3 hr. PR: E.E. 373. Continuation of E.E. 373. High speed binary division, floating point arithmetic, modular or residue arithmetic, and techniques for checking arithmetic are covered. Recent innovations studied as literature becomes available. 3 hr. rec.
380. *Electrical Problems II*. 1-6 hr. For graduate students.
390. *Advanced Independent Study*. 1-6 hr. PR: Consent. Individual investigation in advanced electrical engineering subjects not covered in formal courses.
400. *Seminar*. 0-3 hr. PR: Consent.
411. *Nonlinear Control System Analysis*. PR: Consent. Application of Liapunov's and Popov's methods to nonlinear control systems, together with classical techniques. 3 hr. rec.
413. *Sample-Data Control Systems*. 3 hr. PR: E.E. 312 or consent. A study of control systems in which the activating signal is represented by samples at regular time intervals. 3 hr. rec.
416. *Synthesis of Feedback Systems II*. 3 hr. Continuation of E.E. 316. 3 hr. rec.
430. *Real-Time Control of Electrical Power Systems*. 3 hr. PR: E.E. 231 or consent. Application of computers to modern control theory for reliable and economic real-time operation of integrated power systems. 3 hr. rec.
432. *Protection of Power Systems*. 3 hr. PR: E.E. 231 or consent. Principles of relay protection for faults on transmission lines and other devices: Use of overcurrent, differential distance, and pilot relaying systems. Special relay applications. Determination of short-circuit currents and voltages from system studies. 3 hr. rec.
440. *Electromagnetic Fields and Guided Waves II*. 3 hr. PR: E.E. 340 or equiv. General theory of waveguides, cavity resonators, modes, losses, discontinuities, power considerations, scattering, perturbational and variational techniques. 3 hr. rec.
466. *Informational Theory II*. 3 hr. Continuation of E.E. 366. 3 hr. rec.
471. *Switching Circuit Theory II*. 3 hr. PR: E.E. 370, Math. 236, or equiv. Switching circuit theory is used to model the operations of networks of logic gates and flip-flops. Networks of this type are one form of discrete parameter systems. Studies the use of linear sequential machine as a means of modeling the general class of discrete parameter information systems. Systems approach and the techniques of abstract algebra used throughout. 3 hr. rec.
472. *Digital Systems Design II*. 3 hr. PR: E.E. 372 or consent. (Offered alternate years.) Students will design a specific digital system, i.e. CPU control, interrupt structure, memory, or input/output system. They will design and test a project oriented toward one specific objective.

491. *Advanced Study*. 1-6 hr. PR: Consent. Investigation in advanced subjects which are not covered in regularly scheduled courses. Study may be independent or through specially scheduled lectures.
497. *Graduate Seminar*. 1 hr. PR: Consent. Technical presentations by faculty members, outside speakers and graduate students. Each student will give an oral presentation describing the student's research before the student's final examination. This will typically be a 40-minute presentation before the faculty and graduate students.
497. *Research*. 1-15 hr.

(See additional graduate-level engineering courses listed under "Courses of Instruction in General Engineering," page 183.)

INDUSTRIAL ENGINEERING

Master of Science in Industrial Engineering

Master of Science in Engineering

Students must comply with the rules and regulations as outlined in general requirements for graduate work in the College of Engineering. Each candidate will, with the approval of and at the discretion of the student's graduate committee, follow a planned program which must conform to one of the following outlines:

1. A minimum of 30 semester credit hours, not more than 6 of which are in research leading to an acceptable thesis.
2. A minimum of 33 semester credit hours, not more than 3 of which are in research leading to an acceptable problem report.

In unusual circumstances a student may petition the faculty through the department's Graduate Program Committee to follow a 36 hour, design-oriented Industrial Engineering curriculum with no thesis or problem report.

The M.S.I.E. program which requires a thesis is encouraged for students with an industrial engineering background.

The M.S.E. program which usually requires a problem report is designed for those students without an industrial engineering background who wish to pursue a broader more interdisciplinary program of graduate studies in operations research and industrial engineering.

Departmental Requirements. All students applying to the Department of Industrial Engineering for acceptance to the graduate program will be evaluated by the departmental Graduate Admissions Committee. If there is doubt about a student's ability to handle graduate-level industrial engineering courses because of inadequate background training, then a number of hours of prerequisite industrial engineering courses will be stipulated in addition to the minimum requirements listed above. The Graduate Programs Committee may waive all or some of these prerequisites later based upon student course performance and/or special examination in the background areas.

Entrance Interview. All students beginning graduate study in industrial engineering will be given an entrance interview. The interview determines if a student is adequately prepared to pursue the master's degree program and aid the faculty in advising the student. As a result of the interview, the student and the adviser shall prepare a mutually acceptable preliminary plan of study for review and approval by the Graduate Programs Committee.

Thesis Supervisor. Each student will be assigned to a thesis adviser who will normally serve as chairman of the Examining and Advisory Committee.

Courses. The adviser, in conjunction with an advisory and examining committee to be assigned to each student, will be responsible for following departmental guidelines to determine specific courses appropriate to the student's program. These departmental guidelines are available on request.

Thesis or Problem Report. A thesis or problem report is normally required of all candidates. While required credit in research (I.E. 497) is devoted to the thesis or report preparation, the thesis or problem report is not automatically approved after the required number of semester hours of research work have been completed. The thesis or problem report must conform with the general requirements of the Graduate School and with any additional requirements established by the Department of Industrial Engineering.

Final Examination. A candidate will be required to pass a written departmental examination on course work and an oral examination on course work and the thesis or problem report.

Doctor of Philosophy

A candidate for the degree of Doctor of Philosophy in the Ph.D. program must comply with the rules and regulations as outlined in "A Guide to the Graduate Program in Engineering" and by the Graduate School, and any specific requirements of the Department of Industrial Engineering. A program with a major in industrial engineering, designed to meet the needs and objectives of each student, will be developed in consultation with the student's adviser, the student's advisory and examining committee, and the departmental Graduate Programs Committee. Early in the doctoral program the student will be required to demonstrate Master's level proficiency in Industrial Engineering subject matter. Upon completion of the course work the student must pass a comprehensive examination to be admitted to candidacy, and a dissertation must be written.

The doctoral dissertation research is expected to constitute a significant contribution to the art or science of engineering, with a high degree of creative and original effort. The dissertation must have good literary form and style. In addition, it must contain a thorough review of the work of others in the candidate's area of research, done to acceptable standards of documentation. Upon completion of the dissertation, the candidate will be required to defend the candidate's logic, critical ability, and reasoning power at an oral examination in the general field of study related to the research.

Industrial Engineering

I.E.

- 213. *Engineering Statistics.* 3 hr. PR or Conc.: Math. 17 or consent. Sample spaces and probability. Normal, binomial, Poisson, and other distributions with engineering applications. Measures of central tendency and dispersion. Tests of significance and confidence intervals. Introduction to analysis of variance and regression analysis. Engineering applications emphasized throughout.
- 214. *Analysis of Engineering Data.* 3 hr. PR: I.E. 213. Introduction to linear statistical models. Design and analysis of simpler experimental configurations occurring frequently in engineering studies. Similarities and differences between regression and experimental design models emphasized in a vector-matrix setting. Emphasis on the use of Statistical Analysis System (SAS). No computer programming background is assumed on the part of the student.
- 215. *Statistical Decision Making.* 3 hr. PR or Conc.: I.E. 213. Basic concepts of probability theory. Discrete and continuous distributions, joint and derived distributions, with application to industrial and research problems. Introduction to generating functions and Markov chains.

222. *Job Evaluation and Wage Incentives*. 3 hr. PR: I.E. 140 or consent. Principles used in evaluating jobs, rates of pay, characteristics and objectives of wage incentive plans; incentive formulae and curves.
242. *Production Planning and Control*. II. 3 hr. PR: I.E. 100, 140, 213. Planning, scheduling, routing, and dispatching in manufacturing operations and production control systems. Problems in industrial plant design. Layout for operation and control. Space utilization. 3 hr. rec.
243. *Plant Layout and Design*. 3 hr. PR: I.E. 142. Problems in industrial plant design. Equipment location, space utilization, layout for operation and control, flow sheets, materials handling. Allied topics in power utilization, light, heat, and ventilation. 1 hr. rec., 6 hr. lab.
249. *Design of Dynamic Materials Systems*. 3 hr. PR: I.E. 140 or consent. Application of industrial engineering theory and practice to selection of material systems and equipment including efficient handling of materials from first movement of raw materials to final movement of finished product. Present quantitative design techniques.
250. *Introduction to Operations Research*. 3 hr. PR: I.E. 213 or consent. Basic tools and philosophies of operations research. Tools include: linear programming, queueing theory, inventory theory, and simulation. Other operations research techniques presented as they relate to the overall systems philosophy.
251. *Analytical Techniques of Operations Research*. 3 hr. PR: I.E. 213 or consent. Survey of nonlinear optimization techniques useful in operations research and industrial engineering studies. Includes classical optimization techniques, quadratic, geometric and dynamic programming, branch and bound and gradient techniques.
253. *Applied Linear Programming*. 3 hr. PR: I.E. 250 or consent. Application of the assignment, transportation, and simplex algorithms to typical industrial problems. The methods and computational efficiencies of the revised simplex and other algorithms are also studied.
259. *Introduction to Systems Engineering*. 3 hr. PR: I.E. 250, or consent. Quantitative synthesis of OR models. Definition of terms. Development and testing of assumptions, objectives, and restrictions. Measurement of parameters in the model. Optimization techniques and error sensitivity of the optimal solution. Implementing, utilizing, and upgrading the model.
260. *Human Factors Engineering*. 3 hr. PR: Consent. A survey of human factors engineering which includes the study of ambient environment, human capabilities, and equipment design. Systems design for the man-machine environment interfaces will be studied with emphasis on health, safety, and productivity.
277. *Engineering Economy*. 3 hr. PR: Junior standing. Derivation of compound interest formulas and using them as a tool of decision making. Comparison of various alternatives based on annual costs, present worth, rate of return, benefit-cost ratio before and after income taxes. Depreciation methods, sensitivity analysis, sunk costs, increment costs, retirement, and replacement.
280. *Industrial Engineering Problems*. 1-3 hr. PR: Consent. Special problems.
281. *Digital Computation for Engineers*. 3 hr. Conc.: Math. 16. Introduction to FORTRAN programming for engineering students. Emphasis will be on the development of skills in both problem definition and coding. Class projects will be chosen to illustrate selected numerical and non-numerical processing methods.
282. *Digital Computer Concepts*. 3 hr. PR: I.E. 281 or consent. Principles of digital computer functional components. Study of digital operating systems including structure of the various subsystem components such as monitors, input control systems, and loaders.

283. *Information Retrieval*. 3 hr. PR: I.E. 281 or consent. Tools, elements, and theories of information storage and retrieval. Documentation, information framework; indexing; elements of usage, organization and equipment; parameters and implementation; theories of file organization and system design.
284. *Simulation by Digital Methods*. 3 hr. PR: I.E. 213, 281, or consent. An introduction to digital (Monte Carlo) simulation methods and their application to operations research problems. Students will develop computer programs to simulate and analyze practical situations. Interpretation of results emphasized.
300. *Special Topics in Manufacturing Processes and Automation*. 3 hr. PR: I.E. 100 or equiv. Special topics concerning manufacturing processes and automation with special emphasis on manufacturing management.
313. *Statistical Methods in Engineering*. PR: Math. 17. Introduction to statistical methods in engineering including probability and random variables, empirical and theoretical distributions, hypothesis tests, and elementary regression analysis.
314. *Design of Industrial Experiments*. 3 hr. PR: I.E. 214 or consent. Continuation of I.E. 214. Study of more complex experimental design especially useful to engineering and industrial researchers, including factorials and optimum-seeking design. Emphasis on use of existing digital computer routines and interpretation of results.
325. *Management Control*. 3 hr. PR: I.E. 170 or consent. Effective techniques for higher management control, including current concepts and controls applicable to production management problems.
338. *Technology Forecasting*. 3 hr. A study of the various procedures used in forecasting technical developments.
339. *Technology Assessment*. 3 hr. A study of the various procedures used in technology assessment. The implications of technology in various aspects of society will be stressed.
340. *Fundamentals of Traditional Industrial Engineering*. 3 hr. Basic fundamentals of traditional industrial engineering including methods studies and improvement methods and activity analysis charts, work measurement, job evaluation, plant layout, and materials handling principles.
341. *Methods Analysis and Work Simplification*. 3 hr. Advanced study of the techniques of methods analysis, including modern means of methods research. Development of appropriate cost analyses to accompany improved operating plans. A study of the design, installation, and administration of work simplification programs, suggestion systems, and remuneration policies, and the means of intra-plant communications concerning such programs. 2 hr. rec., 3 hr. lab.
342. *Advanced Production Control*. 3 hr. PR: I.E. 250. Different mathematical models useful in the design of effective production control systems. The various models to be covered include: static production control models under risk, and uncertainty, dynamic models under certainty, under uncertainty, and under risk.
350. *Survey of Operations Research*. 3 hr. PR: I.E. 213 or consent. A survey of operations research methods for graduate students with no previous background in operations research. Topics to be covered include linear programming, project management, queueing theory, inventory theory, and simulation.
354. *Case Studies in Operations Research*. 3 hr. PR: Consent. This course will examine the applications of operations research procedures in a variety of applications. The course objective is to examine the factors which lead to successful model building through case studies.
355. *Scheduling and Sequencing Methods*. 3 hr. PR: I.E. 250. Theory and application of analytical models used in the scheduling of operations. Topics include single machine scheduling models, flow shop models, job shop models, and assembly line balancing methods.

357. *Management Applications of Operations Research*. 3 hr. Examination of the contributions which operations research may make in business administration. Topics include linear programming, simulation, project management, data analysis, and data processing.
358. *Special Topics in Systems Analysis and Operations Research*. 3-6 hr. PR: Consent. Special topics from recent developments in operations research and related fields. Special emphasis will be placed on interests of current graduate students.
359. *Operations Research for Public Administrators*. 3 hr. Examination of role of quantitative analysis in public administration and decision-making.
360. *Human Factors System Design*. 3 hr. PR: I.E. 260 or consent. Theoretical aspects and practical applications of man/machine relationships as they influence future system design. The student will examine human limitations with respect to acceptance of information, decision making, and ability to transmit the result of such decisions to controlled equipment systems to obtain design optimization. 2 hr. rec., 3 hr. lab.
361. *Industrial Hygiene Engineering*. PR: Consent. The recognition of environmental stresses present in man-machine systems and the effect of these stresses on health, safety, and performance of man. Calibration procedures, proper sampling, and field survey techniques will be stressed.
368. *Advanced Problems in Human Factors*. 1-3. PR: I.E. 260 or 360 and graduate standing. Special problems relating to one of the areas of human factors, such as simulation, controls, vigilance, safety, and occupational health.
377. *Advanced Engineering Economy*. 3 hr. Special emphasis on depreciation, engineering and economic aspects of selection and replacement of equipment; relationship of technical economy to income taxation, effect of borrowed capital and pricing model.
381. *Integrated Data Processing*. 3 hr. PR: I.E. 281 and consent. Advanced work in electronic data-processing systems and procedures design. Case studies of integrated data-processing systems. Course projects will include individual use of a computer in management data-processing analysis problems.
385. *Digital Computer Applications*. 1 hr. PR: Senior standing in engineering, physical science or mathematics. Special study of selected programming languages.
389. *Special Topics in Industrial Data Processing Systems*. 3 hr. PR: I.E. 281 or consent. Selected topics relating to industrial applications of computer and data processing systems. Emphasis on applications not in the FORTRAN language.
431. *Traffic Flow Theory*. 3 hr. PR: I.E. 213 and C.E. 439 or consent. Hydrodynamic, car-following, and queueing theory models of traffic flow. Emphasis on the application of probability theory models to traffic situations.
451. *Nonlinear Programming*. 3 hr. PR: I.E. 250 or consent. Advanced study of the techniques of nonlinear programming and their applications. Topics covered include steepest descent, Newton's method, Fletcher-Powell, conjugate gradients, Powell's method, and penalty function methods.
452. *Queueing Theory*. 3 hr. PR: I.E. 213 and 250 or consent. Analytical modeling of waiting line systems with emphasis on determining the best operating conditions for those systems. Single-channel and multi-channel models. Computational methods (including Monte Carlo techniques) are examined. Applications to problems such as maintenance and inventory control.
453. *Theory of Linear Programming*. 3 hr. PR: I.E. 250 or consent. Study of procedures available for solving large-scale optimization problems using linear programming. Topics include decomposition techniques, multiple pricing, cycling, inverse generation and storage, ranging procedures, and upper bound algorithms.
454. *Inventory Theory*. 3 hr. PR: I.E. 213 and I.E. 250 or consent. Techniques used in optimization of inventory systems. Elements of static, deterministic inventory models,

and static, stochastic inventory models. Dynamic inventory models. Selected topics related to inventory analysis.

- 455. *Probability Theory for Engineers*. 3 hr. PR: I.E. 213 or consent. Probability theory and its application to industrial systems with particular emphasis on inventory, queueing, maintenance, reliability, and quality control systems. Markov processes are covered.
- 456. *Applied Stochastic Processes*. 3 hr. PR: I.E. 455. Stochastic systems with emphasis on application to inventory and queueing theory. Conditional probability, Poisson processes, counting processes, renewal processes, Markov chains with discrete and continuous parameters.
- 457. *Dynamic Programming*. PR: I.E. 250 or consent. Introduction to basic structure and computational aspects of dynamic programming and applications including sequential decision problems, deterministic and probabilistic models over finite and infinite planning horizons and Markovian decision processes.
- 458. *Integer Programming and Applied Networks*. PR: I.E. 250 or consent. Introduction to application of integer programming and maximum flow networks to engineering and operations research problems. Emphasis on problem formulation and solution.
- 480. *Seminar*. 1-6 hr. PR: Consent. Discussion of research in industrial engineering and special problems.
- 484. *Advanced Digital Simulation*. PR: I.E. 284 or consent. Analysis and comparison of special purpose digital simulation languages such as GPSS, SIMSCRIPT, GASP, CSMP, DYANAMO, and JOB SHOP simulation.
- 497. *Research*. 1-15 hr.

(See additional graduate-level engineering courses listed under "Courses of Instruction for General Engineering," page 183.)

MECHANICAL ENGINEERING AND MECHANICS

The Department of Mechanical Engineering and Mechanics has programs leading to the degrees of Master of Science in Mechanical Engineering (M.S.M.E.) and Master of Science in Engineering (M.S.E.). At present there are four major areas of study within the department which enable students to pursue broad or concentrated educational programs. These areas are (1) solid mechanics and materials, (2) dynamics and controls, (3) fluid mechanics, and (4) thermal energy. A student's program may emphasize either the design or research aspects of engineering.

Educational objectives of the department's Master's degree programs are:

(1) To provide advanced, and often terminal, training for students in or entering the engineering profession, and/or

(2) To provide the basic graduate educational experience for students wishing to pursue the Ph.D.

Master of Science in Mechanical Engineering

Students wishing to pursue a program leading to an M.S.M.E. should have a B.S.M.E. from an accredited ECPD curriculum, or its equivalent. Students with other than a mechanical engineering background normally will be requested to strengthen their mechanical engineering background.

Minimal Requirements. Thirty semester hours of approved graduate level courses which must include at least 6 hours of mathematics, 3 hours of engineering

methods, and 12 total hours of courses from at least two areas of study in the Department of Mechanical Engineering and Mechanics.

Master of Science in Engineering

This program generally is intended for students who desire to do graduate work in areas other than their baccalaureate major. Students desiring to pursue such a program in the Department of Mechanical Engineering and Mechanics must meet similar general requirements as for the M.S.M.E., although their overall program may be more flexible.

Thesis. A thesis may be required in any of the above degree programs. No more than 6 hours of research credit may be given for an acceptable thesis.

Final Examination. Ordinarily a final examination is required for all candidates for the masters degrees.

Doctor of Philosophy

Students intending to pursue a Ph.D. program in the Department of Mechanical Engineering and Mechanics should have earned a B.S. or M.S. degree in some discipline of engineering. While it is possible for a student with a B.S. degree to enroll directly in the Ph.D. program, it is usually advisable to earn a master's degree first.

As with the department's masters programs, the courses of study are selected to fit the individual interests and objectives of the student, with proper attention given to the rounding out of related areas of study and meeting the College's interdisciplinary curriculum requirements. Generally, a typical Ph.D. program will conform to the following outline.

First Year — Master's Degree

Second Year —

- (a) An approved program of study consisting of approximately 30 credit hours of 300 and 400 series courses (some approved 200 series courses are acceptable)
- (b) Admission to Candidacy
 - i. Qualifying examinations covering the student's major and minor areas of study
 - ii. Defense of research proposal
 - iii. Completion of all program requirements

Third Year —

- (a) Dissertation
- (b) Final Examination

The research work for the doctoral dissertation is expected to represent a significant contribution to the art or science of engineering. It may entail a fundamental investigation into a specialized area, or a broad and comprehensive study of a novel system design. In either case, a high degree of creative and original effort is required to meet the standards of acceptability.

The student must pass a final examination in defense of the dissertation that is administered by the student's research committee.

Mechanical Engineering and Mechanics

M.E.M.

200. *Advanced Mechanics of Materials I*. 3 hr. PR: M.E.M. 52 or consent. Theories of failure and design procedures; time and temperature dependent behavior; shear center, unsymmetrical bending, curved beams. 3 hr. rec.
204. *Dynamics of Physical Systems*. 3 hr. PR: M.E.M. 52 and Math. 18 or consent. Physical systems such as hydraulic, mechanical, electrical, electromechanical, electrohydraulic, hydromechanical, and thermodynamic considered. Emphasis on the modeling of compound systems and studying their natural behavior using analytical techniques. Use of computers in analysis of physical systems.
210. *Kinematics*. 3 hr. PR: M.E.M. 112 and Math. 18 or consent. Geometry of constrained motion, kinematics synthesis and design, special linkage. Coupler curves, inflection circle, Euler-Savary equation, cubic of stationary curvature and finite displacement techniques. 3 hr. rec.
222. *Mechanical Vibrations*. 3 hr. PR: Math. 18, M.E.M. 112, or consent. Fundamentals of vibration theory. Free and forced vibration of single and multiple degree of freedom systems. Solution by Fourier and Laplace transformation techniques. Transient analysis emphasized. Energy methods. 3 hr. rec.
232. *Introduction to Feedback Control*. 3 hr. PR: Math. 18, E.E. 105 or M.E.M. 204 or consent. Fundamentals of automatic control theory. Transfer functions and block diagrams for linear physical systems. Proportional, integral, and derivative controllers. Transient and frequency response analysis using Laplace transformation.
236. *Systems Analysis of Space Satellites*. 3 hr. PR: Senior standing. Introduction to engineering principles associated with analysis and design of space satellites. Emphasis on the interdisciplinary nature of satellite systems analysis. 3 hr. rec.
238. *Introduction to Underwater Engineering*. 3 hr. PR: Consent. Underwater portion of our world with emphasis on science and technology. Emphasis on economic and social needs for maritime resources, maritime law, and public policy, as well as general and basic engineering aspects of the underwater communication, navigation, and structures.
240. *Problems in Thermodynamics*. 3 hr. PR: M.E.M. 141 or consent. Thermodynamic systems with special emphasis on actual processes. Problems presented are designed to strengthen the background of the student in the application of the fundamental thermodynamic concepts. 3 hr. rec.
242. *Bioengineering*. 3 hr. Introduction to human anatomy and physiology using an engineering systems approach. Gives engineering student basic understanding of the human system so that the student may include it as an integral part of the design.
244. *Introduction to Gas Dynamics*. 3 hr. PR: M.E.M. 144 or consent. Basic fundamentals of gas dynamics, one-dimensional gas dynamics and wave motion, methods of measurement, effect of viscosity and conductivity, and concepts from gas kinetics. 3 hr. rec.
250. *Heat Transfer*. 3 hr. PR: M.E.M. 101 or 140. Steady rate and transient conduction. Thermal radiation. Boundary layer equations and forced and free convection are also covered. 3 hr. rec.
254. *Applications in Heat Transfer*. 3 hr. PR: M.E.M. 250. For students desiring to apply basic heat transfer theory and digital computation techniques to problems involving heat exchangers, power plants, electronic cooling, manufacturing processes, and environmental problems.
262. *Internal Combustion Engines*. 3 hr. PR: M.E.M. 101 or 141. Thermodynamics of internal combustion engine; Otto cycle; Diesel cycle, gas turbine cycle, two- and four-

cycle engines, fuels, carburetion and fuel injection; combustion; engine performance, supercharging. 3 hr. rec.

- 264. *Heating, Ventilating, and Air Conditioning*. 3 hr. PR: M.E.M. 141 or consent. Methods and system of heating, ventilating, and air conditioning of various types of buildings, types of controls and their application. 3 hr. rec.
- 282. *Engineering Acoustics*. 3 hr. PR: Math. 18 or consent. Basic theory of sound propagation and transmission. Identification of important industrial noise sources and sound measurement equipment. Selection of appropriate noise criteria and control methods. Assessment of noise abatement technology. Laboratory studies and case histories.
- 290. *Seminar*. 1-6 hr. PR: Junior, senior, or graduate status, and consent.
- 294. *Special Topics*. 1-6 hr. PR: Junior, senior, or graduate status, and consent.
- 299. *Special Problems*. 1-6 hr. PR: Junior, senior, or graduate status.
- 301. *Advanced Engineering Acoustics*. 3 hr. PR: M.E.M. 282 or consent. Study of complex sound generation and the propagation, transmission, reflection, and absorption of airborne and structure-borne sound. Coupling of sound and vibration in structures. Acoustical behavior and characteristics of materials.
- 305. *Analytical Methods in Engineering I*. 3 hr. PR: Consent. Index notation for determinants, matrices, and quadratic forms; linear vector spaces, linear operators including differential operators; calculus of variations, eigenvalue problems, and boundary value problems.
- 306. *Analytical Methods in Engineering II*. 3 hr. PR: M.E.M. 305 or at least two semesters of advanced calculus. Intended for advanced graduate students interested in modern analysis for engineering applications.
- 307. *Non-linear Analysis in Engineering*. 3 hr. PR: Consent. Special topics in non-linear analysis of various types of engineering systems. Various numerical, approximate, and analytical techniques chosen to suit the needs and interests of advanced graduate students.
- 310. *Advanced Mechanics of Materials II*. 3 hr. PR: Consent. Beams on elastic support, cylindrical shells with bending, torsion of noncircular members, two-dimensional applications in elasticity, contact stresses, and simple problems in plates and shells. 3 hr. rec.
- 312. *Inelastic Behavior of Engineering Materials*. 3 hr. PR: M.E.M. 51, 52 and consent. Characterization and modeling of typical engineering materials, elastic, visco-elastic, and plastic materials, design considerations.
- 316. *Energy Methods in Applied Mechanics*. 3 hr. PR: Consent. Variational principles of mechanics and applications to engineering problems; principles of virtual displacements, minimum potential energy, and complementary energy. Castigliano's theorem. Hamilton's principle. Applications to theory of plates, shells, and stability. 3 hr. rec.
- 318. *Continuum Mechanics*. 3 hr. PR: M.E.M. 51, 52. Emphasizes the basic laws of physical behavior of continuous media. Analysis of stress; equations of motion and boundary conditions; kinematic analysis; rates of strain, dilation and rotation; bulk time, rates of change; constitutive equations with special attention to elastic bodies and ideal fluids; energy equations and the first law of thermodynamics. 3 hr. rec.
- 320. *Theory of Elasticity I*. 3 hr. Cartesian tensors; equations of classical elasticity, energy, minimum, and uniqueness theorems for the first and second boundary value problems; St. Venant principle; extension, torsion, and bending problems. 3 hr. rec.
- 322. *Advanced Vibrations I*. 3 hr. PR: M.E.M. 222 or consent. Dynamic analysis of multiple degree of freedom discrete vibrating systems. Lagrangian formulation, matrix and numerical methods, impact and mechanical transients.

325. *Experimental Stress Analysis*. 3 hr. PR: M.E.M. 51, 52. Classical photoelasticity, brittle lacquers, birefringent coatings, strain gage techniques and instrumentation, as applied to problems involving static stress distributions. 2 hr. rec., 3 hr. lab.
330. *Instrumentation in Engineering I*. 3 hr. PR: Consent. Theory of measuring systems, emphasizing measurement of rapidly changing force, pressure, strain, temperature, vibration, etc. Available instruments, methods of noise elimination, types of recording studied. Special value to students in experimental research. 2 hr. rec., 3 hr. lab.
333. *Advanced Machine Design*. 3 hr. PR: M.E.M. 134 or consent. Design for extreme environments, material selection, lubrication and wear, dynamic loads on cams, gears, and bearings, balancing of multiengines and rotors, electromechanical components.
340. *Advanced Thermodynamics I*. 3 hr. PR: M.E.M. 141. First and second laws of thermodynamics with emphasis on the concept of entropy production. Application to a variety of nonsteady open systems, thermodynamics of multiphase, multicomponent and reacting systems. Criteria for equilibrium and stability.
342. *Advanced Thermodynamics II*. 3 hr. PR: M.E.M. 340 or consent. Continuation of topics related to reactive systems. Adiabatic flame temperatures, reaction kinetics, conservation of species equations, flame propagation and detonation.
344. *Statistical Thermodynamics*. 3 hr. PR: M.E.M. 340 or equiv. Microscopic thermodynamics for Boltzmann, Bose-Einstein, and Fermi-Dirac statistics. Schrodinger wave equation, partition functions for gases and solids.
348. *Heat Transfer*. 3 hr. PR: Undergraduate course in heat transfer or consent. Graduate course in heat transfer primarily for mechanical engineering students. Topics include one-, two-, and three-dimensional thermal conduction involved in mechanical processes both for constant and time varying temperature fields, free and forced convection in heat exchangers, heat power equipment and aircraft and radiative heat transfer between surfaces and absorbing media as found in furnaces, industrial processes, and aerospace applications.
350. *Conduction Heat Transfer*. 3 hr. PR: M.E.M. 250 or consent. Analytical, numerical, graphical, and analog solutions of steady and non-steady heat conduction problems in isotropic and anisotropic solids. Thermal properties, extended surfaces, thermal stress, interphase conduction with moving interface, localized and distributed sources.
352. *Intermediate Dynamics*. 3 hr. PR: M.E.M. 52. Newtonian and Lagrangian mechanics. Dynamics of discrete systems and rigid bodies analyzed utilizing Newtonian and Lagrangian formulations.
353. *Advanced Dynamics I*. 3 hr. PR: M.E.M. 352 or consent. Analytical mechanics. Stability of autonomous and nonautonomous systems considered and analytical solutions by perturbation techniques introduced. Hamilton-Jacobi equations developed. Problems involving spacecraft, gyroscopes and celestial mechanics studied.
354. *Convection Heat Transfer*. 3 hr. PR: M.E.M. 250 or consent. Laminar and turbulent flows. Analytical, numerical, and analogical solution. Selected topics study of current research publications.
355. *Radiation Heat Transfer*. 3 hr. PR: M.E.M. 250 or consent. Classical derivation of black body radiation laws; gray body and non-grey analysis; radiant properties of materials, radiant transport analysis, specular-diffuse networks, gas radiation, thermal radiation measurements; analytical, numerical solutions, and study of selected current publications.
360. *Fluid Mechanics I*. 3 hr. PR: M.E.M. 144 or equiv. Advanced dynamics and thermodynamics of fluids. Basic laws of conservation of mass and momentum in differential, vector, and integral forms. Application to internal flows, fluid machinery, and structures.

364. *Turbomachinery*. 3 hr. PR: M.E.M. 101 or 141. Flow problems encountered in design of water, gas, and steam turbines, centrifugal and axial flow pumps and compressors, design parameters.
384. *Feedback Control in Mechanical Engineering*. 3 hr. PR: M.E.M. 232 or consent. Control analysis of hydraulic and pneumatic closed-loop systems including spool valves, flapper valves, pumps, servomotors, and electrohydraulic servomechanisms. Investigation of nonlinearities by phase plane, Liapunov, and describing function techniques. Programming for analog and digital computer simulation. Introduction to fluidic elements and logic circuits.
394. *Special Topics*. 1-6 hr. For senior and graduate students.
399. *Special Problems*. 1-6 hr. For senior and graduate students.
414. *Theory of Elastic Stability*. 3 hr. PR: Consent. Stability of discrete mechanical systems, energy theorems, buckling of beams, beam columns, and frames, torsional buckling, buckling of plates and shells, special topics.
419. *Topics in Fluids and Solids*. 3 hr. PR: Consent. Finite elasticity and viscoelasticity, non-Newtonian fluids, non-linear constitutive theories, special topics in solids and fluids.
421. *Theory of Elasticity II*. 3 hr. PR: M.E.M. 320 (or M.E.M. 310 and consent). Complex variable methods, potential methods, elastic-viscoelastic correspondence principle, boundary value problems, various special topics. 3 hr. rec.
422. *Advanced Vibrations II*. 3 hr. PR: M.E.M. 222, M.E.M. 322 or consent. Dynamic analysis of continuous media. Vibration and wave motion analysis of strings, elastic bars, beams, plates and fluid columns. Earthquake wave propagation.
424. *Theory of Plates and Shells*. 3 hr. PR: M.E.M. 310. Theory of rectangular and circular plates, membrane shells of revolution, shells with bending stiffness, dynamic response of plates and shells.
428. *Photomechanics*. 3 hr. PR: M.E.M. 200, 325. Theory of optics, birefringence, stress-optic law, polariscope, compensation. Techniques of model making, photography, polariscope use. Photoelastic coating methods and use of various reflective polariscopes. Data interpretation by various methods including principal stress separation by shear difference, oblique incidence and graphical integration. 2 hr. rec., 3 hr. lab.
431. *Instrumentation in Engineering II*. 3 hr. PR: M.E.M. 330. Continuation of M.E.M. 330 with emphasis on transducers for static and dynamic measurement and their use in practical measuring systems. 3 hr. rec.
440. *Irreversible Thermodynamics I*. 3 hr. PR: M.E.M. 340 or consent. Phenomenological treatment of the laws of dynamics and thermodynamics for irreversible processes in continuous media. Linear laws for combined irreversible phenomena including viscous dissipation, heat conduction, diffusion, chemical reactions and electric and magnetic effects, are developed taking into account Curie's principle and the Onsager relations. The principle of the minimum rate of creation of entropy is extended to establish criteria for the stability of stationary states. Tensor and variational methods are employed.
441. *Irreversible Thermodynamics II*. 3 hr. PR: M.E.M. 440. Continuation of M.E.M. 440 with emphasis on selected topics from such applications as thermoelectricity, anisotropic heat conduction, stability of fluid motion, thermal diffusion and separation, viscochemical drag, electro chemical cells, and other coupled phenomena of physical or biological interests.
454. *Advanced Dynamics II*. 3 hr. PR: Consent. Advanced study in dynamics. Topics covered are either non-linear vibration, advanced control theory or stability theory depending on student demand.

461. *Fluid Mechanics II*. 3 hr. PR: M.E.M. 360 or equiv. Statistical nature of turbulence, correlation functions and fourier representations. Kinematics of isotropic and non-isotropic turbulent flows. Experimental methods. Application to dynamic loading on structures, diffusion and dispersion of contaminants by turbulent fields and heat and mass transfer.
491. *Advanced Study*. 1-6 hr. PR: Consent. Advanced study in areas not covered by formal courses.
492. *Seminar: Engineering Education*. 1-6 hr. PR: Consent. Studies and group discussion of selected problems in engineering education. Emphasis on application of educational principles to specific areas in engineering education.
493. *Seminar: Bioengineering*. 1-6 hr. PR: Consent. An exposition of contemporary topics in bioengineering. Topics include advancements in biomedical instrumentation, prosthetics, cardiovascular research. biological controls, biomechanics, neurophysiological research, human factors and anthropometrics.
494. *Seminar*. 1-6 hr. PR: Consent. Discussion, library readings, and individual study reports in the mechanical engineering field.
497. *Research*. 1-15 hr. PR: Graduate standing.
499. *Graduate Colloquium*. 1-6 hr. PR: Consent. For graduate students not seeking course work credit but who wish to meet residence requirements, use university facilities and participate in its academic and cultural programs.

(See additional graduate-level engineering courses listed under "Courses of Instruction for General Engineering," page 183.)

Human Resources and Education

The College of Human Resources and Education includes the departmental program and service areas of Counseling and Guidance, Curriculum and Instruction, Education Administration, Educational Psychology, Family Resources, Health Education, Reading, Rehabilitation, Special Education, Speech Pathology and Audiology, and Technology Education. In these, the College brings together several disciplines devoted to the study and maximum development of human talent and resources, whether in the context of the school, the family, or the community. Programs of instruction, research, and extended service are carried out in close cooperation with other related departments and divisions of West Virginia University.

Admission and Curriculum

All students apply for admission to the Graduate School through the Office of Admissions and Records. All candidates for graduate degrees must conform to the general regulations of the Graduate School. Certain details in regard to admission to specific graduate programs of the College of Human Resources and Education are provided on the following pages. Additional information may be obtained by writing the department chairperson in which the graduate program is offered, or by writing the Dean of the College of Human Resources and Education.

The curriculum and degree requirements of the various master's degree programs of the College of Human Resources and Education are given in each of the respective departments. It is the responsibility of the student to take steps to insure being properly informed of the requirements of the degree toward which the

student aspires and/or the certification standards to which the student may wish to conform. Members of the faculty and the student's adviser will offer counsel on these matters upon request.

Doctor of Education

The degree of Doctor of Education (Ed.D.) is a competency-based program. The student's adviser and committee determines the competencies the student must attain and how they are to be evaluated. The degree requires that the candidate demonstrate an ability to conduct research. Faculty expertise and College of Human Resources and Education support services are available for students desiring to elect research projects in any of the following areas: counseling and guidance and rehabilitation counseling, curriculum development (elementary or secondary areas), education administration, engineering education, health education, music education, physical education, reading, safety studies, special education, educational psychology, speech pathology and audiology, and technology education. It may be possible for committees to be formed which can guide doctoral research in other areas as well. However, the applicant should write the Dean of the College of Human Resources and Education to verify this before enrolling at WVU.

Admission. Individuals who wish to pursue a program leading to the Doctor of Education degree must be admitted to the Graduate School. All applicants for admission to the doctoral program in the College of Human Resources and Education must submit scores on the aptitude test of the Graduate Record Examination and comply with the general regulations of the Graduate School. Acceptance for study toward the doctoral degree in a specified area of concentration will be made by the faculty of the specific program and department.

Doctoral Committee. Having received an affirmative recommendation for admission to a specific program, the student recommends a chairperson and four committee members as the student's doctoral committee for approval by the faculty members involved, the chairperson of the department, and the Dean of the College. At least one member of the doctoral committee must come from a supporting discipline outside the College of Human Resources and Education and no more than three from any single program area of the College of Human Resources and Education.

Curriculum. The final determination of the program of course work and research is the responsibility of the student's doctoral committee. The Doctor of Education degree is not awarded on the basis of the completion of any set number of credits but is awarded on the basis of demonstrated academic achievement and scholarly competence. The minimum course work shall be 70 semester hours of relevant graduate work, excluding dissertation credit but including credits of relevant graduate work completed at the master's degree level. A minimum of 24 of the 70 semester hours shall be in the area of major concentration and a minimum of 24 of the 70 hours from a major area of concentration in a supporting or related discipline.

Admission to Candidacy Examination. The purposes of the admission to candidacy examination are to assess the quality of the student's academic achievement, to review the student's program of course work, to approve a proposed outline of dissertation research, and to admit the student to formal candidacy for the degree.

The student and the committee at the time of program planning will include competencies to be developed and how they will be assessed. These will be written

into the student's program. The doctoral student and the permanent committee will determine when the student is ready for assessment of competencies.

The examination will be prepared and assessed by the student's doctoral committee. The chairperson will notify the student and the student records office, who will notify all appropriate offices of the outcome. Upon successful completion of the admission to candidacy examination, the student will be admitted to formal candidacy for the doctoral degree.

Dissertation. The candidate must submit and justify a prospectus for a doctoral dissertation as a portion of the admission to candidacy examination. The doctoral committee must review and *approve*, *approve with change*, or *reject* the outline or prospectus. The student shall consult with all members of the doctoral committee and with other appropriate members of the University faculty during the dissertation phase of the program.

Final Oral Examination. The student will be admitted to final oral examination upon completion of the dissertation and after fulfilling all other requirements set by the committee. The examination will be conducted by the student's doctoral committee and will be open to all members of the University faculty. The candidate will not be recommended for the doctoral degree if the student receives more than one unfavorable vote from the doctoral committee.

Time Limitation. All requirements must be completed within seven years.

Residency. The minimum is two semesters of residence in full-time graduate study at WVU.

Doctor of Philosophy in Psychology (Ph.D.)

A Doctor of Philosophy (Ph.D.) program in Education Psychology is offered jointly by the Department of Educational Psychology and Department of Psychology. Admission to the program is open only to those students who intend to pursue their graduate studies as full-time students. Students admitted to the program must satisfy the minimal requirements of the Department of Psychology, the Division of Education, and the Graduate School. Those students having no previous graduate training, as well as students with a master's degree, will be eligible for admission provided they can meet the admission requirements as established by the interdepartmental committee.

The program is designed to allow students to pursue an area of concentration in learning and development with cognate areas in research, measurement, statistics, instructional design, or curriculum development.

Requests for admission application, as well as for specific guidelines for entrance to the educational psychology program, will be provided by the Department of Educational Psychology or the Department of Psychology.

Further information may be obtained at the Department of Psychology.

Certificate of Advanced Study in Education

This program is designed to prepare school and related personnel who wish professional training beyond the master's degree. Candidates for the Certificate of Advanced Study in Education may choose from among the following areas of study for their area(s) of concentration: (a) Administration and Supervision; (b) Curriculum and Instruction; (c) Counseling and Guidance, Reading, and Special Education; (d) Physical Education, and (e) Safety Studies. Persons interested in the certificate should consult with the director of the appropriate division or Dean of the College of Human Resources and Education.

Admission. Individuals who wish to pursue a program leading to the certificate must be admitted to the Graduate School. All applicants for admission to the program in the College of Human Resources and Education must submit scores on the aptitude test of the Graduate Record Examination and comply with the general regulations of the Graduate School. Acceptance for study toward the certificate in a specific area of concentration will be made by the faculty of the specific program and department.

Requirements for Admission to Candidacy. (1) Evidence through examination, personal letter, and personal interview of general proficiency, acceptable standards of oral and written communication. (2) Satisfactory completion *in residence* at WVU of at least 6 semester hours of approved course work beyond conferring of the master's degree.

Program. An approved program consisting of a minimum of 30 semester hours earned above the master's degree including 24 hours of course work in the College of Human Resources and Education, or in closely related fields, and 6 hours of research.

At least 24 semester hours of the work credited for this certificate must be done in residence at WVU. This includes the 6 hours of research which may be conducted apart from the physical limits of the University but must be done under the direction and supervision of the chairperson of the student's graduate committee. A maximum of 6 semester hours earned in residence at another approved graduate institution or in WVU off-campus education, may, if approved by the student's adviser, be allowed toward credit for the certificate. The minimum period of full-time graduate study in residence at WVU is one semester or one full summer session.

Final Examination(s). Upon completion of all requirements, including the research report, the candidate will be admitted to a final oral examination by the student's graduate committee.

Time Limitation. All requirements must be completed within seven years immediately preceding the awarding of the certificate.

COUNSELING AND GUIDANCE (M.A.) AND REHABILITATION COUNSELING (M.S.)

The Departments of Counseling and Guidance and Rehabilitation Counseling offer a combined curriculum at the master's degree level. All students enroll for a general counseling core during their first semester and then take a speciality curriculum for the balance of their graduate studies. A number of courses are designed on a competency basis.

General Requirements for Admission

The following steps are necessary for admission:

1. Application to WVU Office of Admissions and Records.
2. Special application to the Departments of Counseling and Guidance and Rehabilitation Counseling.
3. Minimum undergraduate grade-point average in accord with Graduate School standards for admission as a Regular Graduate Student.
4. Bachelor's degree and course work in appropriate areas.
5. Satisfactory references.
6. A personal interview with faculty members and student representatives.
7. Approval of application by the departmental Admissions Committee.

Students are encouraged to pursue as much of their program as possible on a full-time basis. Applications from part-time students will be accepted providing such applicants are engaged in counseling functions in their schools or agencies. A limited number of applicants will be considered for part-time study who are not employed at the time of application. The Admissions Committee will grant admission to such applicants based upon special request and submission of a planned program approved by the chairperson of the department.

Core Requirements for Counseling and Guidance and Rehabilitation Counseling

All students will be expected to take the following core courses:

C&C 301 — Fundamentals of Counseling

C&G 302 — Human Relationships

C&G 303 — Basic Course in Guidance

C&G 305 — Theory and Practice of Human Appraisal

C&G 306 — Counseling Theory and Techniques

Speciality Areas

The following speciality areas are available through the combined Departments of Counseling and Guidance and Rehabilitation Counseling:

Rehabilitation Counseling — Rehabilitation Counseling is a professional counseling speciality that provides vocational and personal counseling to physically handicapped clients, persons with learning difficulties, and those who are seeking readjustment from psychiatric problems. Counselors work for both public and private rehabilitation agencies, centers, and workshops.

The degree requirements include completion of the core courses, required Rehabilitation Counseling courses, and a 10-12 hour supervised clinical practice placement (internship) under faculty direction in a rehabilitation setting. The program requires a minimum of 42 semester hours with a 3.0 grade-point average. In most cases, the total program will range between 42-48 semester hours. In addition to completing all course work and the internship satisfactorily, a candidate must demonstrate the ability to assume the responsibility required of a professional counselor and the personal characteristics essential to effective working relationships with others.

The choice of courses comprising the speciality area will be determined by an evaluation of the needs of the individual student.

After completion of the core courses, the following courses — in addition to electives — will be required:

Rehab. Counsel. 300 — Introduction to Rehabilitation Services

Rehab. Counsel. 310 — Medical Aspects of Rehabilitation

Rehab. Counsel. 312 — Psychological Aspects of Disability

Rehab. Counsel. 320 — Voc. Development and Occupational Choices

Rehab. Counsel. 491 — Directed Study and Research

Rehab. Counsel. 462 — Clinical Conference in Rehabilitation

Rehab. Counsel. 472 — Counseling Practicum

Rehab. Counsel. 475 — Clinical Practice

Students may take the professional certification examination to obtain national certification as a rehabilitation counselor.

Counseling and Guidance — Counseling provides a broad opportunity to work with children at the elementary-school level, adolescents at the secondary-school level, young adults at the college level, and in community agencies. The school counselor is involved in personal counseling, career guidance, vocational and educational counseling, family counseling, and consultation on classroom problems with teachers and administrators. Counselors must be equipped to work with both individuals and groups. Much of the school counselor's work is carried out in classrooms with teachers and students. The school counselor also is active in working with community agencies. At the college level, the counselor may work extensively with the special educational services available for the benefit of the college student. Degree requirements include completion of the core curriculum, required Counseling and Guidance course work, and 4 semester hours of practicum under faculty direction. The program requires a minimum of 36 hours with a 3.0 grade-point average. In addition to completing all course work and the practicum satisfactorily, the candidate must demonstrate the ability to assume the responsibility required of a professional counselor and the personal characteristics essential to effective working relationships with others.

In addition to the core course work, students will take:

C&G 308 — Organization and Development of Counseling and Guidance Services

C&G 309 — Group Counseling Theory and Techniques

C&G 320 — Vocational Development and Occupational Choices

C&G 331 — Consultation Techniques

C&G 385 — Practicum

Professional Counselor Endorsement for School Counselors in West Virginia (Certification)

1. A minimum grade-point average of 3.0.
 2. Recommendation of the faculty.
 3. A valid professional teaching certificate at the level for which counseling and guidance endorsement is desired.
 4. Two years of successful educational experience in teaching or counseling and guidance or a combination thereof at a level for which endorsement is desired. (A new experimental alternate pattern has been approved for 1978 which substitutes a one-year internship for the teaching experience. A departmental representative should be contacted for more information.)
 5. Completion of C&G 331 — Consultation Techniques.
- (An active summer program is available for part-time students. Degree requirements may be completed in three consecutive summers.)

Community Counseling — In reviewing the curriculum available in Counseling and Guidance and Rehabilitation Counseling, the applicant will note that much of the course work provides the background applicable for employment in general community agency work. Some of our graduates who do not take employment directly in rehabilitation or school settings find a limited number of opportunities as general counselors in the fields of public welfare, mental health, drug and alcohol counseling, employment security, and corrections.

Counseling and Guidance (Certificate of Advanced Study)

Admission

1. Completion of a master's degree in Counseling and Guidance or equivalent comparable to WVU master's degree in Counseling and Guidance with approved practicum experience.
2. Minimum graduate grade-point average of 3.0.
3. A total score of 1,000 on the Graduate Record Examination aptitude test is recommended.
4. Personal interview with faculty members in Counseling and Guidance.
5. Demonstration of competency in counseling, measurement, statistics, and the guidance function in education as evidenced by reference and appropriate examinations.
6. Evidence of successful appropriate work experience.
7. Written justification for choice in area of specialization.
8. Three references for recommendation.
9. Plan of study approved by adviser.

Areas of Specialization

Elementary School Counseling
Student Personnel Work
Employment Counseling
Pupil Personnel Services

Secondary School Counseling
Correctional Counseling
Research in Counseling

Requirements for Graduation

- A. Completion of 36 semester hours of approved graduate work.
- B. A minimum grade-point average of 3.2 on all course work attempted under the Certificate of Advanced Study Program.
- C. Demonstration of competencies as a specialist in chosen area of specialization.
- D. Recommendation of the Department.

Program

1. 12 semester hours core from Counseling and Guidance:
385 — Practicum, 3 hr.
331 — Consultation Techniques, 3 hr.
480 — Advanced Counseling Techniques, 3 hr.
469 — Theory and Practice of Student Appraisal, 3 hr.
2. 12 semester hours elected with adviser's consent in specialty area of advanced courses external to the Counseling and Guidance program area.
3. 6 hours to achieve competence in consumption and production of field research.
4. 6 hours research problem in area of specialization.

Residency (Minimum)

- A. One semester or two summers (12 hr.) on campus.
- B. Program completion of 12 hr. off-campus and transfer, *or* approved interuniversity cooperative program.

Counseling and Guidance And Rehabilitation Counseling (Ed.D.)

Doctoral study in Counseling and Guidance includes courses in the following areas: Measurement and evaluation, consultation and teaching, and counseling practice. The program typically includes course work hours in excess of the minimum limits established in the College requirements for the Ed.D. degree.

Entrance Requirements

1. Admission to the WVU Graduate School.
2. Completion of a master's degree program in Counseling and Guidance, Rehabilitation Counseling, or equivalent. The equivalency should be comparable to the WVU master's degree program.
3. No minimum grade-point average has been established for admission to the program, except that established by the Graduate School. It is recommended, however, that the student's graduate grade-point average be in the vicinity of 3.5.
4. Complete the aptitude section of the Graduate Record Examination and have the scores of those tests placed on file in the department. No cut-off score has been established, but most students admitted to the program have a total aptitude score of around 1,000.
5. A personal interview with the faculty is necessary. If this is not possible, the department reserves the right to have the applicant be interviewed by a professor in another institution who can make recommendations regarding the student's qualifications for doctoral study.
6. At least three references should be submitted to the department and should pertain to the individual's competency in counseling, measurement, statistics, research, etc. The references also should contain information regarding the individual's personal characteristics particularly as they relate to the completion of a doctoral program.
7. The application form for a doctoral program should be completed.
8. Upon the completion of the above steps, the materials will be reviewed by the faculty which is usually conducted during the months of January and February. Announcements regarding admission are made on or before March 15. Materials received after January 15 will not be reviewed until the following year. All students not enrolling for courses during the year following admission must reapply before taking course work.

Doctoral Competency Demonstration

The doctoral student will demonstrate minimal competency in each of the three doctoral curriculum areas in partial fulfillment of candidacy requirements. The minimal competencies are determined by the area curriculum committees.

Counseling and Guidance

C&G

216. *Behavior Problems and the School*. I, II, S. 2 hr. A course primarily oriented toward assisting educators utilize current psychological principle related to classroom discipline, as well as academic and social adjustment.
283. *Workshop in Counseling and Guidance*. I, II, S. 1-12 hr. PR: Consent. To take care of credits for special workshops and short intensive limit courses on methods, supervision, and other special topics.

301. *Fundamentals of Counseling*. I, II, S. 3 hr. PR: Consent. Development and application of basic counseling skills including interviewing, clinical observation, and a general orientation to counseling settings. Evaluation will be based on strengths and deficits in intra and interpersonal skills and on demonstration of counseling skills in checkout situations. In setting laboratory experience required.
302. *Human Relationships*. I, II, S. 1-3 hr. PR: Consent. Experientially based learning model which focuses on group processes and procedures. Provides self-screening opportunities for prospective counselors. Evaluation is based on personal characteristics essential to effective working relations with others.
303. *Basic Course in Guidance*. I, II, S. 3 hr. An overview of the counseling profession, treating current practices and issues.
305. *Theory and Practice of Human Appraisal*. I, II, S. 3 hr. An overview of standardized evaluation methods commonly utilized in educational and rehabilitation settings. Experience is provided in selection, administration, and interpretation of selected instruments.
306. *Counseling Theory and Technique*. II, S. 3 hr. PR: C&G 303 and consent. A study of counseling approaches commonly used in public schools, colleges, and rehabilitation agencies. Application of theory emphasized.
308. *Organization and Development of Counseling and Guidance Services*. I, S. 2 hr. PR: C&G 303, 305, 306. Operation of guidance program in terms of personal functions, relationships, physical facilities, instructional integration, law and regulations. Consideration will be given to current professional issues.
309. *Group Counseling Theory and Techniques*. II, S. 3 hr. PR: Consent. Theories of group counseling and demonstrations of specific group techniques. Evaluation will be based on expertise in group facilitation. (*Course will not be offered Second Semester, 1978-79.*)
310. *Introduction to Student Personnel Work in Higher Education*. I. 3 hr. PR: Consent. A historical and topical study of the development of student personnel structure and functions in higher education. (*Course will not be offered in 1978-79.*)
320. *Vocational Development and Occupational Choices*. II, S. 2-4 hr. PR: C&G 303. Principles and methods involved in vocational counseling. The use of occupational and educational information and theories of career development in vocational guidance.
330. *Elementary School Guidance*. I, S. 3 hr. PR: Consent. Practical application of the principles of guidance to the elementary school. (*Course will not be offered in 1978-79.*)
331. *Consultation Techniques*. I, II, S. 3 hr. PR: C&G 306 and consent. A specialized multiple training experience covering advanced theory, techniques and practices, skill development in teacher, and parental consulting. (*Course will not be offered First Semester, 1978-79.*)
382. *Special Topics*. I, II, S. 1-6 hr. PR: Advanced standing and consent. Independent study and directed readings in specialized areas of counseling and guidance.
385. *Practicum*. I, II, S. 1-12 hr. PR: Preregistration, cleared for graduation at close of semester, or M.A. degree, and consent of departmental practicum evaluation committee. An intensive supervised practical experience in the public schools or agencies, in counseling with individual critique and appropriate small group experiences. Demonstration of high professional standards, counseling skills, and personal characteristics appropriate to the counseling relationship are essential.
395. *Problem in Counseling and Guidance*. I, II, S. 1-12 hr. PR: Consent. Study and research for master's degree in Counseling and Guidance.
463. *Advanced Theories of Counseling*. II, S. 3 hr. PR: Practicum in counseling, admission to advanced graduate study, and consent. A comprehensive study of the theoretical

issues in contemporary counseling. (*Course will not be offered Second Semester, 1978-79.*)

464. *Individual Intelligence Testing and Interpretation*. I. 4 hr. PR: Advanced standing and preregistration with instructor (9 hr. psychology, and demonstration of proficiency in measurement needed for admission). Administering, scoring, and interpreting individual intelligence tests.
466. *Manpower Utilization and Development*. II. 3 hr. PR: Advanced standing and consent. Economic, social, and political implications of manpower utilization and the role of the counselor to assist society with its pressing demands. (*Course will not be offered in 1978-79.*)
469. *Advanced Theory and Practice of Human Appraisal*. I, II. 3 hr. PR: C&G 305 and consent. Advanced study in the application of assessment procedures to analyze specific problems in counseling and guidance and consideration of alternative methods for measuring human behavior. (*Course will not be offered Second Semester, 1978-79.*)
472. *Internship in Student Personnel Work*. I, II. 1-12 hr. Designed to offer advanced graduate students an opportunity to practice under close supervision professional skills required in the broad field of student personnel work in higher education. (*Course will not be offered in 1978-79.*)
480. *Seminar*. I, II, S. 1-6 hr. PR: Advanced standing and consent. Seminar for Certificate of Advanced Studies and Doctoral students in Counseling and Guidance.
490. *Teaching Practicum*. I, II. 1-3 hr. PR: Consent. Intended for graduate students with college teaching responsibility.
491. *Advanced Study*. I, II, S. 1-6 hr. PR: Consent. Investigation in advanced areas of Counseling and Guidance and Rehabilitation Counseling.
492. *Seminar*. I, II, S. 1-6 hr. PR: Consent.
493. *Seminar*. I, II, S. 1-6 hr. PR: Consent.
494. *Seminar*. I, II, S. 1-6 hr. PR: Consent.
495. *Seminar*. I, II, S. 1-6 hr. PR: Consent.
496. *Graduate Seminar*. I, II. 1 hr. PR: Consent. Designed to permit each graduate student an opportunity to present his research to the assembled faculty and graduate student body. (Graded as S/U.)
497. *Research*. I, II, S. 1-15 hr. PR: Consent. Dissertation.
498. *Thesis*. I, II, S. 2-4 hr. PR: Consent.
499. *Graduate Colloquium*. I, II, S. 1-6 hr. PR: Consent. For graduate students not registered in regular coursework but who have need to use University facilities for completion of their research or program.

Rehabilitation Counseling

Rehab. Counsel.

300. *Introduction to Rehabilitation Services*. I. 2 hr. PR: Consent. Introduction to comprehensive rehabilitation, its history and development as a philosophy, process, and professional area. Rehabilitation counselors and other rehabilitation disciplines in various settings. Counseling and other services involved in rehabilitation.
310. *Medical Aspects of Rehabilitation*. II. 3 hr. PR: Consent. An overview of medical aspects and implications of disability for the handicapped person in the rehabilitation process. Studies of the more common severe disabilities and their remediation also will be included.

312. *Psychological Aspects of Disability*. II, S. 1-3 hr. PR: Graduate standing and consent. The impact of disability considering cultural, interpersonal and intrapersonal factors. Methods of assisting persons to adjust to problems of disability. (*Course will not be offered Summer, 1978-79.*)
314. *Special Problems in Rehabilitation*. I, II. 1-3 hr. PR: Graduate standing and consent. Rehabilitation theory and techniques in problems such as blindness, epilepsy, and mental retardation. Concentrated study in special institutes.
320. *Vocational Development and Occupational Choices*. II. 3 hr. PR: Consent and graduate standing in social sciences or education. Principles and methods involved in the vocational counseling and placement of disabled persons. The use of occupational and educational information. Theories of career development, occupational analysis, and work evaluation in rehabilitation.
374. *Field Work in Rehabilitation*. I, II, S. 1-6 hr. PR: Consent. Supervised field work experience in rehabilitation settings to provide rehabilitation counseling students with a more adequate orientation to their profession.
462. *Clinical Conference in Vocational Rehabilitation*. II. 3 hr. PR: Rehab. Counsel. 300, graduate standing, and consent. Exploration and evaluation of current methods of service delivery to vocational rehabilitation clients. Analysis and integration of service systems and the needs of the disabled client. (*Course will not be offered Second Semester, 1978-79.*)
472. *Counseling Practicum*. I, II, S. 1-4 hr. PR: Graduate standing and consent. Supervised experience in the application of counseling techniques in the rehabilitation process. Demonstration of high professional standards, counseling skills, and personal characteristics, appropriate to the counseling relationship are essential. (*Course will not be offered First or Second Semester, 1978-79.*)
475. *Clinical Practice*. I, II, S. 1-2 hr. PR: Consent, following at least one academic semester in classroom. Clinical practice (internship) in selected agencies, rehabilitation centers, clinics, or hospitals conducting an organized program of services for the physically, mentally, emotionally, or socially handicapped. Practice will be under direct supervision of faculty and agency personnel. (*Course will not be offered Second Semester or Summer, 1978-79.*)
480. *Seminar*. I, II, S. 1-12 hr. PR: Consent. Administration of programmatic research; legal and ethical issues in research and service programs, etc.
481. *Special Topics*. I, II, S. 1-6 hr. PR: Consent. Contemporary issues in the behavioral sciences and rehabilitation.
482. *Workshop in Rehabilitation*. I, II, S. 1-12 hr. PR: Consent. Supervision in the counseling process; vocational evaluation in rehabilitation; utilization of rehabilitation research; contemporary issues in rehabilitation.
491. *Directed Study and Research*. I, II. 1-6 hr. PR: Consent. Readings and/or independent research in rehabilitation related topic. (*Course will not be offered Second Semester, 1978-79.*)

CURRICULUM AND INSTRUCTION

The Department of Curriculum and Instruction offers graduate programs leading to the degree of Master of Arts, Certificate of Advanced Studies, and Doctor of Education. In addition professional preparation is available for certification in those specific areas where state certification is required. The major emphasis in all programs is curriculum and teaching with an academic area, teaching area, or area of interest serving as the supporting area. Optional tracks in specific subject and program areas are available as indicated in that program

section of the *Graduate School Catalog*. Programs are offered for those pursuing teaching or curriculum leadership careers in: Early Childhood Education, (ages 3-8), Elementary Education, Secondary Education, or Higher Education.

Master of Arts

Admission Requirements

Graduate students apply to the University Office of Admissions and Records for admission. All applicants must comply with the admission requirements of the Graduate School, the College of Human Resources and Education, the Department of Curriculum and Instruction, and the specific program of interest.

Students may be admitted as degree candidates on submission of an undergraduate grade-point average of 2.5. These students may pursue the program of their choice immediately on *Regular Graduate Student Status*.

Students who do not meet the admission requirements and have a grade-point average of less than 2.5 will be classified as *Special-Provisional* and may take a maximum of 12 semester hours of course work. At the end of this period students may apply to the respective department for review of their admissions classification. Re-classification will be considered *only* in cases in which the student has achieved a minimum grade-point average of *3.0 for the first 12 semester hours of graduate study*. All work taken up to the conclusion of the semester in which the twelfth semester hour is earned will be used in computing the grade-point average. If the student is not reclassified to degree program status by the department, the student is not eligible to continue graduate study leading to a degree in the Department of Curriculum and Instruction. The student may, upon petition in writing to the department chairman, be permitted to take additional course work in that department for the renewal of the teaching certificate.

Optional Routes

A. Thirty semester hours of course work, including 3 semester hours of research.

B. Thirty semester hours of course work, including 3 semester' hours of research, selected in conference with the candidate's committee, directed by the adviser, with final approval by the committee and 27 semester hours of course work.

C. Thirty-six semester hours of approved course work.

Program Requirements

1. *Guidelines* — Specific requirements of the Graduate School, College of Human Resources and Education, and the program being followed will be complied with.

2. *Advising* — All students will be assigned an adviser who will guide the student in course selection and program progress. Two additional faculty members will be assigned to serve as the remainder of the three-member master's committee.

3. *Grade-Point Average* — No student may be awarded a master's degree in Curriculum and Instruction unless the student has a minimum grade-point average of 3.0 on all work taken for graduate credit. (A grade of less than C does not carry credit toward a graduate degree, but will be counted in determining the grade-point average.)

4. *Course Repeats* — No student will be permitted to repeat a required graduate course more than once.

5. *Transfer Credit* — The maximum number of hours which may be used from transfer credit is 12 (30 hr. program), or 14 (36 hr. program). Credit for transfer must be of graduate level from an accredited college or university offering a graduate degree. Only credit of B or higher will be transferred.

6. *Comprehensive Examinations* — The comprehensive examination is required in options A, B, and C above. The candidate's committee will determine whether the examination will be oral, written, or both. Students must submit an application to take the final master's degree examination within the first week of the summer or two weeks of the semester in which they intend to take it. A student must have completed a minimum of 27 semester hours of approved course work before taking the comprehensive examination. In addition a student must have a 3.0 grade-point average on all work taken for graduate credit before *applying* to take the comprehensive examination. All applications should be submitted to the College's Office of Student Advising and Records for processing.

A candidate who fails the final master's degree examination may, upon written consent of the student's advisory committee, be given a second examination not earlier than the following term or semester. A candidate who fails the second examination and desires a third opportunity to complete program requirements may meet at the committee's discretion to determine remediation recommendation before the third and final trial at the examination. The third examination may be given no earlier than one calendar year from the second examination. If the student fails the third comprehensive examination, that student will be removed from the degree program in Curriculum and Instruction.

7. *Program Termination* — Students who fail to meet the specifics of the sections dealing with admission, grade-point average, course repeats, transfer credits, comprehensive examinations, or special requirements, spelled out in writing by a specific program, will not be admitted to or will be terminated from the degree program. Students not admitted to or terminated from a degree program may apply in writing through the department chairman or the Office of Student Advising and Records of the College of Human Resources and Education to be classified as a "Special Graduate Student" (non-degree). This would allow the student to take course work for certificate renewal, certification, or personal interest, but not applicable for a degree in the department.

Curriculum for Elementary School Classroom Teachers

Master of Arts		Hours		
I. Required Courses	Program A ¹	B ¹	C ¹	
C&I 301	3	3	3	
Rdng. 321	3	3	3	
C&I 330	3	3	3	
C&I 340	3	3	3	
C&I 350	3	3	3	
Ed. Found. 320 or 340	3	3	3	
Ed. Psych. 330	3	3	3	
Ed. Psych. 320	3	3	0	
C&I 497	6	0	0	
C&I 391	0	3	0	
Total	30	27	21	

II. Approved Elective Options

A. Subject Specialization	0	3	0-15
(At least 9 hrs. must be in subject specialization courses, with enrollment not occurring before adviser approval)			
B. General Education	0	0	0-15
(All courses must be approved by the adviser before enrollment)			
Total for Masters Degree	30	30	30

A¹— Thesis required

B¹— Research Problem Required

C¹— 36 semester hour course work program

Curriculum for Early Childhood Education

Master of Arts

Hours

I. Required Courses	Program A ¹	B ¹	C ¹
C&I 312	3	3	3
C&I 314	3	3	3
C&I 316	3	3	3
Rdng 381	3	3	3
CDFR 341	3	3	3
Ed. Psych. 330	3	0	0
C&I 391	0	3	0
C&I 498	6	0	0
Total	24	18	15
Electives	6	12	21
Total for Master's Degree	30	30	36

II. Approved Electives

Early Childhood Education	3-12
Other Education	6-18
Non-Education	0-12

A¹— Thesis required.

B¹— Research problem required.

C¹— 36 semester hour program for classroom teacher.

Curriculum for Secondary School Classroom Teachers

(Students must contact their adviser for information regarding specific course requirements in each area of emphasis — English, Science, Social Studies, Mathematics, etc.)

Master of Arts

Hours

I. Graduate Courses in Education	12-21
Required Courses	6
Program A ¹ B ¹ C ¹	
C&I 304	3 3 3
Ed. Found. 320 or Ed. Found. 340	3 3 3
Ed. Psych. 330.....	3 3 0
Ed. Psych. 320.....	3 3 0
C&I 391	0 3 0
C&I 497	6 0 0
Approved Education Electives	0 3 6
II. Graduate Courses in One of the Candidate's Certified Fields	9-21
(Candidates with Library Science as a major teaching field must follow the Teacher-Librarian curriculum.)	
III. Graduate Courses in Another of the Candidate's Teaching Fields	0-6 (Min.)
(This does not apply to candidates pursuing Programs A or B.)	

A¹ — Thesis required.

B¹ — Research problem required.

C¹ — 36 semester hour program for classroom teacher.

Curriculum for Higher Education Curriculum and Teaching

Master of Arts

Hours

I. Graduate Courses in Education	18
Required Courses in Education	12
Ed. Found. 320 or Ed. Found. 340	3
C&I 307	3
C&I 380 (Teaching Strategies).....	3
Ed. Psych. 300.....	3
II. Approved Education Electives	6
	<hr/>
	18
III. Graduate Courses in an Academic Area	18
	<hr/>
Total.....	36

Curriculum for Health Education

Master of Arts and Doctor of Education programs can be developed in Health Education with an emphasis in either school health education or community health education. Both programs involve a core of courses in Health Education combined with supportive electives designed to satisfy individual needs and professional objectives. All applicants must comply with the requirements of the Graduate

School, the College of Human Resources and Education, and the Department of Health Education.

Master of Arts. To enter as a degree candidate in the Master of Arts program in Health Education, an applicant must have a bachelor's degree from an accredited institution and sufficient background in the area of specialization to qualify for admission to graduate courses in that area. Students with inadequate backgrounds will be required to take additional course work which may not apply to the program. A student who does not have an overall undergraduate grade-point average of 2.5 may be admitted in a special-provisional category. Reclassification will be considered upon completion of 12 hours of course work in Health Education with an overall grade-point average of 3.0.

Additional credit hours may be required beyond the minimum requirements by the graduate committee if the committee determines a need for further strength in specific areas.

Students pursuing a Master's degree in Health Education will have a choice of the following three options:

A. A minimum of 36 semester hours, of which 6 semester hours will be thesis credit. The graduate committee in Health Education will be consulted by the student selecting a thesis topic and in completing the thesis requirement. Approval of the thesis, following a comprehensive oral examination by the graduate committee of the student, will be required before the degree is granted.

B. A minimum of 36 semester hours, of which 3 semester hours is a written research report to be submitted to the student's committee before written comprehensive examinations.

C. A minimum of 36 semester hours of course work followed by written comprehensive examinations.

At the completion of 27 credit hours, the student will schedule comprehensive written and/or oral examinations with the Chairman, Department of Health Education. The comprehensive examination will be administered during the final semester of course work and will be evaluated by the department faculty. If the responses on the examination are unacceptable, a student may be required to take remedial work and retake the examination at a later date.

After the student has completed 12 semester hours, a graduate program committee will review the course work for academic performance to admission to candidacy for the Master of Arts degree.

Doctor of Education. The Doctor of Education degree is offered with an emphasis in school health education or community health education. Admission to the Ed.D. program is contingent upon assessment of: (1) complete official transcripts of all higher education work attempted; and (2) a screening interview which is held during or immediately after the student's first semester of course work. After the screening, the student will be notified by the Chairman, Department of Health Education, of acceptance to pursue graduate study toward candidacy for the Doctor of Education degree.

Master of Arts in Health Education

I. Required Courses	Hours
Health Ed. 301 — Advanced School Health	3
Health Ed. 305 — Philosophy of Health Education.....	3
Health Ed. 306 — Community Health	3
Health Ed. 376 — Evaluation of Health Education Research.....	3
Health Ed. 491B — Roles and Functions of Health Educators	3
Health Ed. 496 — Graduate Seminar.....	1

II. Related Areas of Study

Educational Foundations
Administration and Management
Sociological and Psychological Foundations
Communications
Professional Ethics
Research and Evaluation

III. Special Applications

Health Ed. 385 — Field Practice
Health Ed. 490 — Teaching Practicum
Health Ed. 491 — Advanced Study

Curriculum for Teacher-Librarians

A combination of undergraduate courses and courses in the graduate program is necessary to meet certification requirements.

Master of Arts in Education

Hours

I. Graduate Courses in Education	12
A. Required Courses in Education	9
Ed. Psych. 260	
Ed. Psych. 320	
C&I 391	
B. Approved Electives	3

Curriculum in Reading

Graduate students with successful teaching experience at the elementary, secondary, or college levels, or those who desire to enter these fields, may wish to increase their competence as teachers of reading, to keep informed of latest trends and developments, or to advance to positions of greater responsibility.

The Reading Center offers graduate programs leading to a Master of Arts degree in reading, the Certificate of Advanced Study in reading, and the Doctor of Education degree with a major in reading. Completion of these advanced programs may lead to a certification as a reading specialist or reading supervisor.

Course offerings provide opportunities to become familiar with the organization, implementation, and administration of developmental and remedial reading programs for students at the elementary, secondary, and college levels. Advanced students of superior academic and professional background have opportunities to participate in clinical work, to become involved in research, and to prepare for positions in public and private schools at elementary, secondary, and college levels, as well as related positions in industry and business.

Programs of graduate study are worked out individually with each student. Course requirements depend upon previous academic background and experience and the position for which the student wishes to prepare. Practical training for teachers and specialists-in-training is provided by the Reading Clinic in Allen Hall.

The University Reading Laboratory is a service for undergraduate students who seek help with reading and study skills. This program provides opportunities for experience in college-adult reading for the graduate students in reading who, as teaching assistants, are part of the University Reading Laboratory staff. Practicum experiences may sometimes be available for other graduate students interested in this area.

Certification in Reading

Two licenses for teaching reading are available to West Virginia teachers: a temporary endorsement and an endorsement as a Reading Specialist. (Students who desire reading certification in states other than West Virginia should consult with their adviser and their own State Department of Education concerning the requirements.)

Temporary Endorsement. Twelve semester hours of graduate credit in reading courses are needed for temporary endorsement as a reading teacher. The areas of concentration and approved courses are:

- I. Foundations of Reading Instruction (3 hr.): Rdng. 321 — Reading Instruction in Elementary Schools; Rdng. 322 — Reading Instruction in Secondary Schools; Rdng. 324 — Foundations of Reading Instruction, or Rdng. 327 — Developing Reading Interests.
- II. Diagnosis and Correction of Reading Difficulties (3 hr.); Rdng. 283 — Workshop: Remedial Reading; Rdng. 340 — Diagnostic and Prescriptive Reading Instruction.
- III. Clinical Reading (3 hr.); Rdng. 341 — Problems in Clinical Reading; or Rdng. 444 — Advanced Clinical Reading.
- IV. Planning and Organizing Reading Programs (3 hr.): Rdng. 326 — Leadership Skills for Reading Specialists.

Reading Specialist Endorsement. Thirty semester hours of graduate credit are needed for a Reading Specialist endorsement — 21 semester hours with credit in each area named in Group A, and 9 semester hours with credit in each area named in Group B. The areas of concentration and approved courses:

I. Course Requirements

Group A (21 semester hours)

Foundations of Reading Instruction (12 hr.)

Rdng. 321 — Reading Instruction in Elementary Schools

Rdng. 322 — Reading Instruction in Secondary Schools

Rdng. 324 — Foundations of Reading Instruction

Rdng. 327 — Developing Reading Interests

Diagnosis and Correction of Reading Difficulties (3 hr.)

Rdng. 283 — Workshop: Remedial Reading

Rdng. 340 — Diagnostic and Prescriptive Reading Instruction

Rdng. 442 — Diagnosis of Reading Difficulties

Rdng. 443 — Correction of Reading Difficulties

Clinical Reading (Laboratory Experiences) (3 hr.)

Rdng. 341 — Problems in Clinical Reading

Rdng. 444 — Advanced Clinical Reading

Planning and Organizing a Reading Program (3 hr.)

Rdng. 326 — Leadership Skills for Reading Specialists

Group B (9 semester hours)

Measurement and/or Evaluation (3 hr.)

Ed. Psych. 330 — Advanced Educational Measurements

Rdng. 380/480 — Seminar: Measurement and Eval. in Language Arts

Psychology of Exceptionality (3 hr.)

Sp. Ed. 250 — Survey of Exceptional Children and Adults

Psych. 282 — Exceptional Children

Psychology of Learning and /or Personality (3 hr.)

Psych. 263 — Introduction to Personality

Psych. 264 — Psychology of Adjustment

Psych. 281 — Abnormal Psychology

Psych. 423 — Human Learning

- Ed. Psych. 300 — Advanced Educational Psychology
- Ed. Psych. 450 — Psychological Foundations of Learning
- Ed. Psych. 451 — Principles of Instruction

II. Additional Requirements

- A. A valid professional teaching certificate or its equivalent.
- B. A master's degree in reading or classroom teaching.
- C. Recommendation of the College for a Reading Specialist Certificate.

Master of Arts Degree (Reading)

I. Admission to Program

- A. Accepted to graduate study by the WVU Office of Admissions and Records.
- B. Minimum 2.5 undergraduate grade-point average.
- C. Applicants who do not meet the above criteria may be given probationary admission.
- D. Students must complete 6 or more hours in reading within two years after admission (probationary or regular) or admission will be invalidated and the student will be required to reapply.

II. Program Requirements

- A. Program A — Completion of a minimum of 36 hours including the completion of a problem or thesis.
- B. Program B — Completion of a minimum of 36 hours of course work.
- C. Credit Limitations:
 - 1. No more than 12 hours of graduate credit obtained at other approved institutions may be considered for transfer.
 - 2. Written approval from the adviser before enrollment is necessary before transfer credit can be counted.
- D. A minimum grade-point average of 3.0 is required for graduation.
- E. Successful completion of a written final examination.

III. Course Requirements

(The course requirements in Program A and B lead to Reading Specialist Certification.)
(Electives should be decided in conference with adviser.)

A. Required Courses

	Program	Hours	
		A	B
Rdng. 321		3	3
Rdng. 322		3	3
Rdng. 324		3	3
Rdng. 326		3	3
Rdng. 327		3	3
Rdng. 340		3	3
Rdng. 341		3	3
C&I 301 or 304 or 307		0	3
Ed. Psych. 330 or Rdng. 380/480		3	3
Ed. Psych. 300 or 450 or 451 or Psych. 263 or 264 or 281		3	3
Sp. Ed. 250 or Psych. 282		3	3
Rdng. 495		6	0

36 33

B. Electives 0 3

Total 36 36

Certificate of Advanced Study in Reading

The program for the Certificate of Advanced Study in Reading is designed to help individuals who develop advanced knowledge and professional skill in the language arts area and prepare them to assume leadership positions in educational systems.

I. General Requirements

- A. Complete the general requirements for admission to the WVU Graduate School.
- B. Present at the time of application, proof of a master's degree from an accredited university.
- C. Have a minimum grade-point average of 3.0 on all work completed for the master's degree.
- D. Verify the completion of a minimum of three years of teaching or related experiences.
- E. Plan, with the aid of a CAS committee, a total program of 30 graduate credits, including a 6-hour research project.
- F. Complete a residency requirement of 24 semester hours.
- G. Meet all requirements for a Reading Specialist Certificate.
- H. Maintain an average of 3.0 or above on all course work.
- I. Pass an oral examination on the research project and on all courses taken in Reading.
- J. Meet all the above requirements within the seven calendar years immediately preceding the award of the Certificate of Advanced Study.

II. Course Requirements (30 hours)

	Hours
A. Reading (selected from the following)	15
Rdng. 325 — Survey of Major Problems in Reading	3
Rdng. 332 — Survey of Major Problems in the Language Arts	3
Rdng. 442 — Diagnosis of Reading Difficulties	3
Rdng. 443 — Correction of Reading Difficulties	3
Rdng. 444 — Advanced Clinical Reading	3
Rdng. 480 — Seminar	3
Rdng. 481 — Special Topics	1-6
Rdng. 485 — Practicum	1-12
B. Electives (reading or related courses)	9
C. Research	
Reading 497 — Research	6
Total	30

Selected by adviser and student to meet individual needs and certification requirements.

Reading majors at the CAS level who have not completed prerequisites for the courses selected should plan to do so as additional academic requirements for the degree unless the courses are waived. Prerequisites may be waived by consent of the adviser and Reading Center faculty if in their opinion the student has had background experiences in reading which are equivalent to those provided by the courses listed in the *Graduate School Catalog* as prerequisites.

Doctor of Education (Reading)

Doctoral study in reading is highly individualized. As such, the reading curriculum for a concentration at the doctoral level cannot be prepared in advance. Courses will depend upon the student's background, experience, courses completed at the master's level, and the post-doctoral objectives of the individual. Reading

courses to be completed at another institution must receive prior approval by the student's doctoral committee.

Students who desire to complete the Doctor of Education degree with a concentration in reading must meet the following standards:

I. Admission Requirements

- A. Complete all Graduate School and College requirements for admission to graduate study at the doctoral level.
- B. Provide the Reading Center with the following:
 1. GRE or MAT scores.
 2. Transcripts of all college work.
 3. Three or more letters of recommendation.
 4. Evidence of teaching or other acceptable experiences.
 5. A vita which shows practical work experiences.
 6. A concise statement giving reasons for pursuing a doctoral degree.
- C. Successfully complete a pre-admission written examination.
- D. Successfully complete an oral interview with the Reading Center faculty-student committee.

After consideration of all of the above factors, the Reading Center Doctoral Admissions Committee will inform the student in writing of the Committee decision regarding admission into the Doctoral Program in Reading.

II. Completion Requirements

After the doctoral student has been admitted to the Doctoral Program, the following steps should be taken in cooperation with the student's adviser:

- A. Plan with the adviser the selection of a doctoral committee.
- B. Plan, with the aid of the doctoral committee: (1) a satisfactory course of study with a minimum of 24 semester hours in reading, (2) a minor area of concentration, and (3) selected courses in foundations of education.

III. Admission to Candidacy and Graduation Requirements

- A. Pass the Admission to Candidacy Examination satisfactorily.
- B. Prepare a suitable dissertation, with committee approval, on some phase of reading or language arts.
- C. Pass the final oral examination successfully.
- D. Present suitable printed copies of the dissertation to the Chairperson of the Doctoral Committee, the Reading Department, the Graduate School, and to other University agencies which might require copies.

Curriculum and Instruction

C&I

205. *The Junior High School*. I, II, S. 2 hr. PR: Consent. Developing philosophy, program, and practices of the junior high school.
210. *Early Childhood Education*. I, II, S. 3 hr. PR: CDFR 142, Ed. Psych. 106. Introduction to methods and materials in early childhood education for curriculum, instruction and program organization, development, and evaluation. The content of this course is applicable to field placement in a preschool, nursery school, day care, and/or child development center. (A field experience with children 3-5 years of age is required.)
211. *Early Childhood Education*. I, II, S. 3 hr. PR: CDFR 142, Ed. Psych. 106. This course is designed for individuals who will be working within early childhood programs for children under 8 years of age. The various aspects of early childhood education are studied in relationship to organizational and administrative structures. This includes planning, budgeting, staffing, supervising, and evaluating comprehensive learning facilities for young children. (A field experience with children 3-5 years of age is required.)

267. *The Music Education Program*. S. 3 hr. PR: Consent. Organization and administration of the complete music education program for grades 1-12.
278. *Vocational Home Economics in Secondary Schools*. I. 3 hr. PR: Ed. Psych. 106; 25 hr. in family resources.
279. *Organization Administration of Physical Education*. 3 hr. (Also listed as P.E. 192.)
280. *Special Problems and Workshops*. I, II, S. 1-4 hr. PR: 14 hr. in education. To take care of credits for special workshops and short intensive unit courses on methods, supervision, and other special topics. Maximum of 8 semester hours may be applied toward the master's degree.
287. *Student Teaching Clinical Experience in Early Childhood, Elementary or Secondary Education*. I, II. 2-4 hr. PR: Consent. Advanced course in student teaching, stressing clinical procedures related to learning problems in pre-school, nursery school, day care and/or child care centers, elementary schools, junior high and/or middle schools or high schools.
288. *Clinical Practices in Public-School Speech and Hearing Therapy*. I, II, S. 2-8 hr. PR: Consent. Includes experience in grades 1 to 12. Meets the requirements of SPA 282 and 283.
301. *The Elementary-School Curriculum*. I, II, S. 3 hr. PR: 20 hr. of undergraduate credit in elementary education, or consent. Analysis of curriculum designs in elementary education with emphasis on methods and techniques of development.
304. *The Secondary-School Curriculum*. I, II, S. 3 hr. PR: High-school teaching experience, or consent. Emphasizes socioeconomic and cultural influences on the curriculum; principles of curriculum development; curriculum building in the various teaching fields; techniques of experimentation and evaluation; and practice in curriculum building with special emphasis on unit construction.
307. *Curriculum Development*. I, II, S. 3 hr. PR: C&I 301 or C&I 304 or C&I 312 and Ed. Found. 320 or consent. Basic foundation in the concepts underlying the school curriculum in American society.
312. *Early Childhood Curriculum*. I. 3 hr. PR: C&I 210, 211, consent. Historical, theoretical perspectives in curriculum development for early childhood education including social, creative, cognitive, and physical goals.
314. *Early Childhood Instruction*. II. 3 hr. PR: C&I 312 and consent. Design of instruction for individualization and development of mastery in curriculum goals for early childhood.
316. *Early Childhood Program Development and Evaluation*. I. 3 hr. PR: C&I 312, 314 and consent. Development and evaluation of facilities, programs, and support systems for early childhood education.
317. *Language Skills in Early Childhood*. S. 3 hr. PR: Consent. An examination of language skills and the sequence in which they are learned in early childhood with special attention to the environmental and instructional influences which could contribute to their acquisition. (*Offered in alternate summers.*)
319. *Behavior Modification: Early Childhood Education*. S. 3 hr. PR: Consent. Application of behavior modification to early childhood education with special attention to an examination of the methods and values involved. (*Offered in alternate summers.*)
323. *Contemporary Issues in English Education*. I. 3 hr. PR: Graduate standing. Provides the student with a knowledge of several contemporary issues in English teaching which have immediate and long-range ramifications for secondary-school English instruction. 1-hr. lect., 2-hr. seminar.
324. *Advanced Methods in English Education*. II. 3 hr. PR: Graduate standing. (For classroom teachers of English.) Will involve an analysis of recent trends and inno-

variations in methodology. Readings and discussions will lead to the development of instructional strategies and units for secondary English classrooms. 1-hr. lect., 1-hr. lab., 1-hr. seminar.

330. *Mathematics in the Elementary School*. I, II, S. 3 hr. PR: 20 hr. of undergraduate credit in elementary education or consent. Materials and methods of instruction for modern mathematics programs.
333. *Corrective Techniques in Mathematics Education*. I, S. 3 hr. PR: Consent. Materials and methods used in diagnosis and remediation of learning difficulties in mathematics.
334. *Mathematics in the Secondary School*. I, S. 3 hr. PR: Consent. Patterns of mathematics curriculum in the secondary school; practices in teaching mathematics: preparation, selection and use of instructional materials.
337. *Mathematics in the Junior High School and Middle School*. II. 3 hr. PR: 6 hr. college mathematics or consent. Study of teaching of mathematics in the junior high school and/or middle school; application of mathematics content to teaching; instructional techniques and materials.
340. *Science in the Elementary School*. I, II, S. 3 hr. PR: 20 hr. of undergraduate credit in elementary education, or consent. Analysis of methods, curriculum patterns, and trends in elementary school science. Understanding and development of scientific attitudes appropriate at elementary school level.
350. *Social Studies in the Elementary School*. I, II, S. 3 hr. PR: 20 hr. of undergraduate credit in elementary education, or consent. Comprehensive consideration of objectives, content, methods, including unit procedures; materials including objects, models, exhibits, and museum items, as well as textbooks, collateral reading, maps, and graphs; means of evaluating social growth and development.
354. *Social Studies in the Secondary School*. S. 3 hr. PR: Consent. Nature and function of social studies in the secondary school; utilization of community, state, national, and world resources in teaching; selection of content for teaching purposes; curriculum construction with emphasis on resource and teaching units.
357. *Principles of Economic Education*. S. 3 hr. Workshop for principals, teachers, and supervisors with emphasis on the economic structure of our society and methods of integrating economics into the school program. (Sponsored jointly by College of Human Resources and Education and College of Business and Economics.)
363. *Teaching Young and Adult Farmer Classes*. I, S. 2 hr. PR: Ed. Psych. 106. Participation in conducting young and adult farmer classes and school-community food preservation centers; organization, course of study, and methods of teaching and supervision, and young farmers' association.
364. *Organizing and Directing Supervised Farming Programs*. II, S. 2 hr. PR: Consent. Planning programs of supervised farming, supervising and evaluating such programs for all-day students, young farmers, and adult farmers.
373. *Professional Development*. I, II, S. 1-6 hr. PR: Department approval. Specially designed experiences for those interested in advancing professional skills in a particular specialty. May be repeated. (Graded as S/U.) Not for degree credit in programs in the College of Human Resources and Education.
380. *Special Topics*. I, II, S. 1-6 hr. PR: Consent.
383. *Seminar*. I, II, S. 1-6 hr. PR: Consent.
391. *Problem in Education*. I, II, S. 3 hr. Research for master's degree in education, option B.
395. *Practicum*. I, II, S. 1-12 hr. per sem. or term — aggregating not more than 12 hr. PR: 9 graduate hr. in education. Enrollment with permission of adviser or instructor in

consultation. Special individual and group projects. To provide appropriate residence credits for special workshops, prolonged systematic conferences or problems and projects in education.

407. *Instructional Models of Teaching*. II. 3 hr. PR: Ed. Found. 320 or consent. Concepts and processes involved in teaching and their relationship to the development of teacher education programs.
408. *Contemporary Determinants of Curriculum*. II, S. 3 hr. PR: C&I 307 and Ed. Found. 340 or consent. Contemporary determinants of curriculum development.
409. *Curriculum Theories*. I, II, S. 3 hr. PR: C&I 408 or consent. Theories underlying curriculum from the past to the present and projected to the future.
438. *Survey of Major Issues in Mathematics Education*. II, S. 3 hr. PR: Consent. Individual and group research on selected topics in mathematics education.
457. *Social Studies Curriculum Development, K-12*. I. 3 hr. PR: C&I 301 or 304 and C&I 350 or 354. Stresses the application of principles and procedures pertinent to the development of social studies programs in elementary and secondary schools. Strong emphasis will be placed on the analysis of current social studies curriculum materials.
460. *Planning Programs and Courses for Vocational Agriculture Department*. I, S. 2 hr. PR: C&I 188. Gathering data, studying the farming problems of all-day students, young farmers, and adult farmers, and planning the total program for the department. (Also listed as Ag. Ed. 460.)
490. *Teaching Practicum*. I, II, S. 1-3 hr. PR: Consent. Intended for graduate students with college teaching responsibility. Provides a supervised experience in a teaching situation. (Graded as S/U.)
491. *Advance Study Project in Education*. I, II, S. 3-6 hr. Research for the program leading to the Certificate of Advanced Study in Education.
496. *Advanced Seminar*. I, II. 1 hr. PR: Consent. Opportunity for the advanced graduate student to present the student's research to faculty and/or student groups.
497. *Research*. I, II, S. 1-15 hr.
498. *Thesis*. I, II, S. 2-4 hr. PR: Consent.
499. *Colloquium in Curriculum and Instruction*. I, II, S. 1-6 hr. PR: Consent. For graduate students not seeking course work credit, but who wish to participate in academic programs.

Education Foundations

Ed. Found.

300. *Sociology of Education*. I or II. 3 hr. An examination of education as a social institution; cultural and class influences on education; social roles and career patterns in the school system; the school and problems of the community. (Equiv. to S.A. 232.)
320. *Philosophic Systems and Education*. I, II, S. 3 hr. Examines different systems of educational philosophies, focusing on aims, values, and criteria of education. Stresses the application of philosophic thinking to educational language, issues, methods, and subject matter.
340. *History of American Education*. II, S. 3 hr. Major forces affecting U.S. educational developments at all school levels are examined in political, social, economic and cultural context. Major historical periods include colonial, early national, pre-post civil war and late nineteenth to mid-twentieth century.
380. *Special Problems*. II. 1-6 hr. PR: Consent.

383. *Seminar*. I, II, S. 1-6 hr. Selected topics in historical, sociological, and philosophical foundations of education. Titles to be announced each semester.
390. *Comparative Education*. I, II, S. 3 hr. Current U.S. educational practices and problems at all school levels are examined in relation to selected representative national school systems in Europe, Eastern Europe, Asia, and Africa. (*Not offered first semester or summer, 1978-79.*)

Health Education

Health Ed.

301. *Advanced School Health*. I, S. 3 hr. PR: Graduate standing and consent. Analysis of problems in school health services, healthful school living, nature of health education, and scope of health instruction which confronts teachers and administrators. (*Offered in odd years in fall and summer.*)
305. *Philosophy of Health Education*. I, S. 3 hr. PR: Graduate standing and consent. Analysis of the scientific bases, purposes, procedures, and content, with implications for school and public health education. (*Offered in even years in fall and summer.*)
306. *Community Health*. II, S. 3 hr. PR: Graduate standing and consent. Health problems requiring community action, basic public health activities, community organization for health protection, voluntary health agencies, school health programs and the role of state and federal agencies in the community health program. (*Offered in even years in spring; odd years in summer.*)
376. *Evaluation of Health Education Research*. I, S. 3 hr. PR: Graduate standing and consent. Study of published research to determine basic scientific accuracy and value. (*Offered in odd years in spring, even years in summer.*)
385. *Practicum (Field)*. I, II, S. 1-15 hr. PR: Graduate standing and consent. Under the guidance of faculty and counselors, students may assume major responsibility during a semester in a community-wide program.
490. *Teaching Practicum*. I and II. 1-3 hr. PR: Graduate standing and consent. Supervised practices in college teaching of health related learning experiences.
491. *Advanced Study*. I, II, S. 1-6 hr. PR: Graduate standing and consent. Investigation in advanced subjects which are not covered in regularly scheduled courses. Study may be independent or through specially scheduled lectures.
- 491A. *Human Sexuality and Community*. S. 3 hr. PR: Graduate standing and consent. Analysis of sex-related problems in the community. Principles of prevention and remediation for controversial problems are examined and programs are designed by students based on these principles. Issues: parenting, sex education, pornography, sexual sanctions, etc. (*Offered in alternate summers beginning in 1978.*)
- 491B. *Roles and Functions of Health Educators*. I, II. 3 hr. PR: Graduate standing and consent. An investigation of the roles and functions of health educators in a variety of community settings.
492. *Seminar*. I, II, S. 1-6 hr. PR: Graduate standing and consent.
493. *Seminar*. I, II, S. 1-6 hr. PR: Graduate standing and consent.
494. *Seminar*. I, II, S. 1-6 hr. PR: Graduate standing and consent.
495. *Seminar*. I, II, S. 1-6 hr. PR: Graduate standing and consent.
496. *Graduate Seminar*. I, II. 1 hr. PR: Graduate standing and consent. Graduate students will present at least one seminar to the assembled faculty and graduate student body of this program.

- 497. *Research*. I, II, S. 1-15 hr. PR: Graduate standing and consent.
- 498. *Thesis*. I, II, S. 2-4 hr. PR: Graduate standing and consent.
- 499. *Graduate Colloquium*. I, II, S. 1-6 hr. PR: Graduate standing and consent.

Reading

Rdng.

- 221. *Developmental Reading*. I, II. 3 hr. PR: Consent. Fundamentals of reading instruction. Emphasizes classroom organization and teaching techniques.
- 222. *Reading in the Content Areas*. I, II. 2 hr. Skills and strategies needed by content area teachers to reinforce the reading skills necessary for the effective learning of secondary students in the content areas.
- 240. *Corrective Language Arts Techniques*. I, II. 3 hr. PR: Rdng. 221, consent. Fundamentals of informal language arts diagnosis and corrective classroom language arts instruction. A practicum for the utilization of informal diagnosis and correction techniques is provided.
- 283. *Special Workshop in Reading*. I, II, S. 1-6 hr. For elementary and secondary students in preservice education programs, as well as for elementary and secondary teachers in inservice education.
- 321. *Reading Instruction in Elementary Schools*. I, II, S. 3 hr. Gives students who have little or no background in reading an opportunity to study the reading process and to learn how to apply effective techniques and methods at the elementary school level. Grades K-6.
- 322. *Reading Instruction in Secondary Schools*. I, II, S. 3 hr. The reading skills essential at the secondary level and how they may be developed in the various subject-matter areas.
- 323. *Reading and Early Childhood Education*. I, II, S. 3 hr. PR: C&I 312 or 314. Development of a reading-language program for young children that includes consideration of: (1) the nature of the beginning reading process, and (2) the nature of children's cognitive, perceptual, linguistic, psychological, physical, and social growth.
- 324. *Foundations of Reading Instruction*. I, II, S. 3 hr. The physiological, psychological, sociological, and historical foundations underlying the development of reading proficiency. For majors in education, reading, counseling and guidance, special education, speech communication, and other areas requiring an understanding of the reading process. (Course not offered Second Semester, 1978-79.)
- 325. *Survey of Major Problems in Reading*. II, S. 3 hr. PR: Rdng. 321 or 322 and 324. A research course in which each student will complete an individual problem in an area of special interest. (Course not offered Second Semester, 1978-79.)
- 326. *Reading Leadership Skills*. I, II, S. 3 hr. PR: Rdng. 380/480 or Ed. Psych. 330, Rdng. 340. Roles, responsibilities, and practices of reading specialists and administrators in organizing reading programs from early childhood through college. (Course not offered First Semester, 1978-79.)
- 327. *Developing Reading Interests*. I, II, S. 3 hr. PR: Rdng. 321, 322, 324. Emphasis on methods and techniques for developing reading habits, interests, and tastes and on motivating individuals to read. Special attention is given to integrating the use of children's literature with creative oral and written language. (Course not offered First Semester, 1978-79.)
- 330. *Teaching the Language Arts*. II, S. 3 hr. The interrelationship of the different phases of the language arts. Special attention to organizing the language arts program, selecting materials and equipment, and understanding effective techniques

and methods for teaching listening, oral language, written language, handwriting, and spelling.

331. *Selection and Evaluation of Reading Materials*. I, S. 3 hr. PR: Rdng. 321. Survey of critical reading skills, techniques, and procedures with emphasis on the selection of supplementary materials needed for effective developmental and remedial reading programs.
332. *Survey of Major Problems in the Language Arts*. II, S. 3 hr. PR: Rdng. 330 or consent. An advanced course covering major problems of the teacher or supervisor of language arts instruction. A research course in which the student completes an individual problem.
340. *Diagnostic and Prescriptive Reading Instruction*. I, II, S. 3 hr. PR: Rdng. 321 or 322, 324 and Rdng. 380/480 or Ed. Psych. 330. Course designed to develop and implement theoretical concepts in the diagnosis and prescription of language problems. Emphasis on techniques utilized by classroom and special teachers of reading and language arts.
341. *Problems in Clinical Reading*. I, II, S. 3 hr. PR: Rdng. 340. Laboratory course in remedial reading. Major emphasis on tutoring remedial cases in the Reading Center.
342. *Reading Diagnosis and Prescription in Learning Disabilities*. II, S. 3 hr. PR: Consent. Basic course in diagnostic and prescriptive reading techniques and procedures for learning disability majors. Special emphasis on practicum experiences in administering and interpreting reading tests, as well as prescribing and administering remediation suggestions.
380. *Seminar*. I, S. 1-6 hr. PR: Consent. Seminar for master's degree students stressing special topics concerned with the education and sociological and psychological aspects of language arts instruction.
381. *Special Topics*. I, II, S. 1-6 hr. PR: Consent. Special topics or research in reading and language arts for master's degree students in reading.
385. *Practicum*. I, II, S. 1-12 hr. PR: Consent. Practicum type course for master's degree student teaching, and reading administration and supervision practicum experience can be pursued.
442. *Diagnosis of Reading Difficulties*. I, S. 3 hr. PR: Rdng. 340. Advanced instruction in diagnosis. Emphasis on use of standardization tests, informal tests, machines, and observation in determining reading difficulties.
443. *Correction of Reading Difficulties*. II, S. 3 hr. PR: Rdng. 442 or consent. Advanced instruction in correcting reading difficulties. Emphasis on methods of teaching, use of machines and commercial materials, constructing and using teacher-made exercises, and evaluating progress.
444. *Advanced Clinical Reading*. I, II, S. 3 hr. PR: Rdng. 341. Laboratory course in remedial reading. Emphasis on diagnosis and treatment of reading difficulties.
480. *Seminar*. I, II, S. 1-6 hr. PR: Consent. The interrelationships among the language arts: mental, physical, and psychological deterrents to language arts; and similar topics.
481. *Special Topics*. I, II, S. 1-6 hr. PR: Admission to doctoral program in reading and consent. Advanced seminar. Weaknesses and strengths in current reading programs, needed research in reading, and suggestions for improving reading instruction at elementary, secondary, and college levels.
485. *Practicum*. I, II, S. 1-12 hr. PR: Consent. Practical application of reading theory to organizing and conducting developmental and remedial reading programs.
495. *Problem in Reading*. I, II, S. 3 hr. Research for master's degree in reading.
497. *Research*. I, II, S. 1-15 hr. Research for doctoral degree in reading.

EDUCATION ADMINISTRATION

The Department of Education Administration offers graduate programs leading to the degrees of Master of Arts, Certificate of Advanced Study, and Doctor of Education, as well as professional preparation for certification in principalship, supervision, and superintendency. All students are assigned an adviser upon acceptance into the Department. All students are to contact their advisers for specific program and certification requirements.

Admission Requirements. All applicants must comply with the requirements of the Graduate School, the College of Human Resources and Education, and the Department of Education Administration. Admission to all programs is contingent on assessment of: (1) complete official transcripts of all higher-education work attempted, and (2) other evidence the faculty may deem necessary to judge probable success in a graduate program.

Master of Arts. Optional programs are available in public school administration and supervision, higher education administration, as well as extension and continuing education. A two-semester, field-based experience is required before permanent professional certification can be acquired in public school administration and supervision. In order to graduate, the student must obtain at least a 3.25 grade-point average on all program work attempted.

Certificate of Advanced Study. Advanced work beyond the master's degree may be taken with an emphasis in school district central office administration or in the principalship. A research project or a 6-hour planned field-based experience is required. In order to graduate, the student must defend the research project and obtain at least a 3.25 grade-point average on all program work attempted.

Doctor of Education. The Doctor of Education degree is offered with an emphasis on public school administration, higher education or major education organizations, such as state departments of education. Within the regulations of the Graduate School, the College of Human Resources and Education, and the Department of Education Administration, each program is individually designed by the doctoral student, the student's adviser, and doctoral committee to meet the student's career aspirations.

Education Administration

Ed. Adm.

- 300. *Public School Organization and Administration.* I, II, S. 3 hr. Basic concepts through which administrators, supervisors, and teachers gain understanding of general problems related to operation of schools and school systems.
- 318. *School Business Administration.* I, II, S. 3 hr. PR: Consent. Sound business administration for central office and attendance center school administrators.
- 320. *Personnel Administration.* I, II, S. 3 hr. PR: Consent. The determination of student, employee, and organizational personnel needs and the development of plans and programs to meet these needs.
- 330. *Principles of Education Leadership.* I, II, S. 3 hr. PR: Consent. Problems of school leaders in the areas of administration, supervision, and instruction.
- 331. *Principles of Supervision.* I, II, S. 3 hr. PR: Consent. Elementary, junior high, and senior high supervision.
- 333. *School Law.* I, II, S. 3 hr. PR: Consent. Overview of the generally accepted legal principles which affect the student, teacher, and principal in a public school setting.

351. *Administrative Procedures in Adult Education*. I, II, S. 3 hr. PR: Consent. Theories and principles of administering adult education organizations as they relate to planning, organizing, staffing, initiating, delegating, integrating, motivating, decision making, communicating, establishing standards, financing, and budget defense and control, and measuring results.
352. *Professionalism in Extension Service*. II, S. 3 hr. PR: Consent. Role of Extension Service professionals in social change, study community systems; professional relationships, accountability; ethics, obligations to clientele.
353. *Community Education: Administration and Organization*. I. 3 hr. PR: Consent. Study of the rationale, methods, and procedures in administering and programming community education. Experiences in planning, adapting, and evaluating programs independently and in consort with school and community plans.
354. *Management of Youth Development Programs*. II, S. 3 hr. PR: Consent. Study of the management of youth programs. Emphasis on relationships of management principles to program development, youth needs, work plans, curriculum, resources, and evaluation.
355. *Leadership Development for Youth Programs*. I, II, S. 3 hr. PR: Consent. Fundamentals of administrative leadership development in youth programs. An overview analysis of the tools, tasks, and competencies with emphasis in group dynamics in developing leadership skills of volunteers.
373. *Professional Development*. I, II, S. 1-6 hr. PR: Department approval. Specially designed experiences for those interested in advancing professional skills in a particular specialty. May be repeated. (Graded as S/U.) Not for degree credit in programs in the College of Human Resources and Education.
385. *Practicum*. I, II, S. 1-12 hr. PR: Consent.
388. *Research-Evaluation-Assessment*. I, II, S. 3 hr. PR: Consent. Research, assessment, and evaluation procedures related to administrative decision making and problem solving to increase the general effectiveness of educational institutions.
389. *School-Community Relations*. I, II, S. 3 hr. PR: Consent. A study of the systems through which the school can be interpreted to its community public.
401. *Principalship*. I, II, S. 3 hr. PR: M.A. in Education Administration, or equiv. or consent. School building administration emphasizing planning, policy formulation, decision making, and managerial practices.
402. *Superintendency*. I, II, S. 3 hr. PR: M.A. in Education Administration, or equiv. or consent. Roles, relationships, behaviors, and competencies which characterize the school superintendent and his staff.
403. *Education Administration Theory*. I, II, S. 3 hr. PR: M.A. in Education Administration, or equiv. or consent. Interdisciplinary study of the major concepts of education administration theory and the application to educational settings.
404. *Economics of Public Education*. I, II, S. 3 hr. PR: M.A. in Education Administration, or equiv. or consent. Basic concepts.
405. *Administration of Educational Facilities*. I, II, S. PR: M.A. in Education Administration, or equiv. or consent. The planning, evaluation and management of current and future school facilities.
406. *Public Education and the Law*. S. 3 hr. PR: M.A. in Education Administration or equiv. or consent. Legal permissives and limitations involved in setting policy for organization of, and administration of public schools.
407. *Collective Bargaining in Public Education*. II. 3 hr. PR: M.A. in Education Administration, or equiv. or consent. This course is designed to inform school administrators about the concepts and principles of negotiating and implementing collective bargaining agreements.

408. *Organizational Analysis*. I. PR: M.A. in Education Administration, or equiv. or consent. An examination of alternative means for the analysis of organizational structures, interrelationships and functions. A field analysis is required.
409. *Politics of Education*. II. PR: M.A. in Education Administration or equiv. or consent. An examination of the internal political nature of school systems, and of the external influence of legislative, judicial and administrative bodies, and of interested groups.
459. *Adult and Continuing Education*. I, II, S. 3 hr. Principles, concepts, and processes involved in programming for adults in a community setting. Nature of adult learning, subject matter, and learning environment.
460. *Development of Administration in American Higher Education*. I, II, S. 3 hr. The administrative development of American higher education from 1636 to the present, including internal trends and external forces.
461. *Higher Education Administration*. I, II, S. 3 hr. Organization and administration of higher education institutions.
462. *Higher Education Law*. I, II, S. 3 hr. Critical legal issues of higher education — public and private — using a case study approach.
463. *Higher Education Finance*. I, II, S. 3 hr. Financial concerns in higher education with emphasis on taxation and legislative actions, sources of income, budgeting, and cost analysis.
464. *Issues in Higher Education*. I, II, S. 3 hr. Current societal and institutional issues which tend to shape the mission and life style of an institution.
465. *Institutional Research and Planning*. I, II, S. 3 hr. Accumulation, analysis, and interpretation of data relevant to decision making and the allocation of institutional resources.
466. *The College Student*. I, II, S. 3 hr. Review of research and literature on college students from freshmen through graduate school. Emphasis on student subcultural patterns.
467. *Higher Education Collective Bargaining*. I, II, S. 3 hr. The process and content of collective bargaining in higher education and its impact on institutional governance and academic jurisdictions.
468. *Community and Junior Colleges*. I, II, S. 3 hr. Development, role, functions, organization, and curriculum of community and junior colleges in the United States, with special emphasis on West Virginia.
469. *Higher Education Internship*. I, II, S. 3 hr. Practical experiences in the administration of an organizational unit under supervision of the unit's chief administrator. (May be repeated for credit.)
470. *Principal's Planned Field-Based Experience*. I, II. 3 hr. PR: Three years of successful experience as a teacher and have a position as principal or assistant principal. Consists of problem-solving techniques and seminar-types of activities as applied to explicit problems in the professional environment. Required for permanent certification as a principal.
471. *Supervisor's Planned Field-Based Experience*. I, II. 3 hr. PR: Three years of teaching experience, 15 hours completed in a master's degree program, and be employed full-time as a supervisor. Consists of problem-solving techniques and seminar-types of activities as applied to explicit problems in the professional environment. Required for permanent certification as a supervisor.
472. *Superintendent's Planned Field-Based Experience*. I, II. 3 hr. PR: Five years of successful experience as a teacher or supervisor, and employed as a superintendent or assistant superintendent. Consists of problem-solving techniques and seminar-types of activities as applied to explicit problems in the professional environment. Required for permanent certification as a superintendent.

480. *Seminar*. I, II, S. 1-6 hr. PR: Consent.
485. *Special Topics*. I, II, S. 1-6 hr. PR: Consent.
490. *Teaching Practicum*. I, II, S. 1-3 hr. PR: Consent. Supervised practices in college teaching.
491. *Advanced Study*. I, II, S. 1-6 hr. PR: Consent. Advanced subjects which are not covered in regularly scheduled courses. Study may be independent or through specially scheduled lectures.
496. *Graduate Seminar*. I, II, S. 1 hr. PR: Consent.
497. *Research*. I, II, S. 1-15 hr. PR: Consent.
499. *Graduate Colloquium*. I, II, S. 1-6 hr. PR: Consent. For graduate students not seeking course work credit but who wish to meet residence requirements, use the University's facilities, and participate in its academic and cultural programs.

EDUCATIONAL PSYCHOLOGY

Educational Psychology offers programs leading to the Master's Degree (M.A.) and to the Doctor of Education (Ed.D.).

Admissions

Students may apply to a program at any time during the year. In order to be considered for the First Semester, a student should have his or her application completed by March 15. For the Second Semester the deadline is November 1, and for the Summer the deadline is March 15. Students will be notified of acceptance or nonacceptance within three weeks of the above dates.

For information write:

Admissions Committee
Educational Psychology Department
Human Resources and Education
608 Allen Hall
Morgantown, WV 26506

Doctoral Programs

Behavioral Analysis in Education

The Behavioral Analysis in Education program approaches problems in education from an applied behavioral science perspective. At present, this program emphasizes: the analysis of educational settings into their observable components, behavioral managements in classrooms, the use of system analysis and behavior analysis in designing and managing instruction, techniques for analyzing, aiding, and consulting with educational institutions, and the study of complex repertoires such as imaginative or creative behavior. The program's goal is to prepare professionals to work at all levels of the education institution. These include, for example, university positions as researchers in the educational process, state college positions as instructors of teachers in the primary and secondary school systems, positions in state departments of education and in federal offices of administrative positions, and positions in industry or elsewhere that require instructional design expertise.

Quantitative Methods

This major will allow the student, upon completion of work, to perform the duties of principal specialist in the area of research, planning, measurement and evaluation working with state boards of education, local school districts, and school systems. This person will be able to serve as a consultant for problems in educational systems evaluations as well as performing field research directed towards the improvement of instruction. The concentration in Quantitative Methods offer the opportunities to develop scientific research skills for those persons who elect to research on a university or laboratory setting.

Requirements

Requirements follow the guidelines for the college as a whole. In addition the department has a core. The student is required to take basic courses in areas other than the area in which he or she is specializing.

Educational Psychology

Ed. Psych.

231. *Sampling Methods*. I. 3 hr. PR: An introductory course in statistics. Methods of sampling from finite and infinite populations, choice of sampling unit, sample survey design, estimation of confidence limits and optimum sample size, and single- and multi-stage sampling procedures.
260. *Instructional Media and Technology*. I, II, S. 3 hr. The development of competencies in the use and construction of visual material and the technology for its utilization with various instructional procedures. Emphasis is on actual production and laboratory experience.
300. *Advanced Educational Psychology*. I, II, S. 3 hr. Designed for beginning graduate students. Psychological principles of learning and development as they relate to processes of classroom instruction.
311. *Statistical Methods 1*. I, II, S. 3 hr. PR: Math. 3. Basic concepts of statistical models, distributions, probability, random variables, tests of hypotheses, confidence, intervals, regressions, correlation, transformation, F and X^2 distributions, analysis of variance of one- and two-way classification models, multiple range tests, missing plots, and sample size.
312. *Statistical Methods 2*. I, II, S. 3 hr. PR: Stat. 311. Extension of basic concepts of statistical models, design of experiments, multiway classification models, factorials, split plot design, simple covariance, orthogonal comparisons, multiple linear and nonlinear regression and correlation analysis, chi-square, and non-parametric statistics. (*Course not offered First Semester, 1978-79.*)
320. *Introduction to Research*. I, II, S. 3 hr. PR: Ed. Psych. 311. Methods and techniques of research in education. Major emphasis on design, analysis, interpretations, and reporting of research.
321. *Design of Experiments*. I. 3 hr. PR: Ed. Psych. 312 or equiv. Extension of basic concepts of statistics to the more complicated models and use of samples, design and analysis of experiments over time and space, fractional replications, incomplete block design, cross-over designs, lattice designs, and least squares analysis for designs with unequal sub-class numbers.
330. *Advanced Educational Measurement*. I, II. 3 hr. Background for educational measurement, the nature of evaluation, measuring and predicting pupil progress.

Basic statistics including measures of central tendency, percentiles, variability and simple correlation.

333. *Nonparametric Statistics*. II. 3 hr. PR: Introductory course in statistics. Single sample tests; for related samples, two independent samples, K related samples, K independent samples, and measures of correlation.
341. *Multivariate Methods 1*. I. 3 hr. PR: Stat. 311. Elementary matrix operations, partial and multiple linear and non-linear correlation and regression analyses, and introduction to discriminant analysis.
342. *Multivariate Methods 2*. II. 3 hr. PR: Stat. 341 or equiv. The multivariate normal distribution, tests of hypotheses about the sample mean vectors and variance-covariance matrices from a multivariate normal distribution, and analysis of variance of multiple responses in basic statistical designs.
343. *Statistical Analysis in Education*. I, II, S. 3 hr. PR: Ed. Psych. 330 or consent. Review measures of central tendency, percentiles, and correlation. Emphasis placed on correlation, regression, testing hypothesis, non-parametric tests, and other measures in analysis and inference.
350. *Principles of Behavior Modification*. I, II, S. 3 hr. Application of reinforcement theory as an instructional technique in changing human behavior. Analysis of problems in terms of behavior and the design of instruction and treatment programs to produce desired change.
360. *Instructional Systems 1*. I. 3 hr. PR: Ed. Psych. 260 or consent. Delineate topic and concepts; describe target population; develop behavioral objectives; weight objectives; develop test pool; establish performance levels, produce scripts; and produce instructional materials.
361. *Instructional Systems 2*. II. 3 hr. PR: Ed. Psych. 350, 360, or consent. Design of a total instructional system to teach a set of specified objectives to a specific target population of learners, including production questions, and quality control.
362. *Instructional Systems — Administration and Management*. II, S. 3 hr. PR: Ed. Psych. 361 or consent. The conduct of instructional operations within instructional systems; the administration and management of organizational arrangements to support system approaches to instruction.
363. *Communication Theory for Instruction Systems*. I. 3 hr. PR: Graduate standing. Psychological foundations of the communication process in instruction systems.
366. *Instructional Television Utilization*. I, II, S. 3 hr. PR: Advanced senior or graduate standing. Focuses upon planning for various uses of instructional television. State, local school unit, school, and classroom uses illustrated through film and studio production. Production elements for ITV programming are developed throughout television lessons and hands-on assignments.
385. *Practicum*. I, II, S. 1-12 hr. PR: Consent.
391. *Problem in Educational Psychology*. I, II, S. 3 hr. PR: Consent.
420. *Advanced Educational Research*. I, II, S. 3 hr. PR: Stat. 311 and consent. Identification of research problems in education, consideration of alternative designs and methods of investigations, and development of a research proposal at the advanced graduate level.
440. *Human Development and Behavior*. I, II, S. 3 hr. Psychological theories of human development. Contemporary theories analyzed and compared with emphasis on their implication for classroom behavior and the educational process.
446. *Factor Analysis*. II. 3 hr. PR: Stat. 341. Alternative methods for factor extraction, communalities, rotation in orthogonal and oblique space, and estimation of factor scores.

450. *Psychological Foundations of Learning*. I, II, S. 3 hr. Psychological and philosophical foundations of major learning theories and their implications for instructional procedures.
451. *Principles of Instruction*. I, II, S. 3 hr. PR: Consent. Basic principles of teaching-learning process implied in major learning theories; study of factors in learning, variables in instructional program, and principles of instructional design.
480. *Seminar*. I, II, S. 1-6 hr. PR: Consent.
481. *Special Topics*. I, II, S. 1-6 hr. PR: Consent.
490. *Teaching Practicum*. I, II. 1-3 hr. PR: Consent. Intended for graduate students with college teaching responsibility. Provides a supervised experience for graduate students in a teaching situation. (Graded as S/U.)
491. *Advanced Study*. I, II, S. 1-6 hr. PR: Consent. Investigation in advanced areas of educational psychology.
492. *Seminar*. I, II, S. 1-6 hr. PR: Consent.
493. *Seminar*. I, II, S. 1-6 hr. PR: Consent.
494. *Seminar*. I, II, S. 1-6 hr. PR: Consent.
495. *Seminar*. I, II, S. 1-6 hr. PR: Consent.
496. *Graduate Seminar*. I, II. 1 hr. PR: Consent. Designed to permit each graduate student an opportunity to present his research to the assembled faculty and graduate student body. (Graded as S/U.)
497. *Research*. I, II, S. 1-15 hr. PR: Consent. Dissertation.
498. *Thesis*. I, II, S. 2-4 hr. PR: Consent.
499. *Graduate Colloquium*. I, II, S. 1-6 hr. PR: Consent. For graduate students not registered in regular course work but who have need to use University facilities for completion of their research or program.

FAMILY RESOURCES

Family Resources offers work leading to the degree of Master of Science.

All candidates for the graduate degree must conform to the general regulations of the Graduate School and Family Resources.

After applying to the Graduate School, applications will be reviewed by a departmental Graduate Admissions Committee. At that time the applicant will be notified by the Chairman of the Graduate Admissions Committee of acceptance to pursue graduate study toward candidacy for the Master of Science degree, according to the four types of admission described in the *Graduate School Catalog* degree program with the following exception. A student who does not have an overall undergraduate grade-point average of 2.75 may be admitted in the *special provisional* category. Reclassification will be considered upon completion of 12 hours of course work in Family Resources with a grade-point average of 3.0. Additional information may be obtained by writing the Chairman of Family Resources.

The graduate program is designed to offer students opportunity to work in a variety of different specializations, as well as the opportunity to take graduate level course work in supporting disciplines.

The following Master of Science programs are offered:

(1). Home Economics Education — A dual program is offered enabling the student to be granted a vocational certificate with the master's degree. An

applicant must have graduated from an accredited institution with an earned teaching certificate. Teaching and/or work experience is strongly recommended.

(2). Child Development/Family Relations — The particular weighting of the two areas in this program will be determined by the student's interest and need. An undergraduate major in family resources, psychology, or sociology/anthropology is recommended.

(3). Human Nutrition — The program in human nutrition has two emphases: clinical dietary counseling, nutrition education, or experimental nutrition. American Dietetics Association membership requirements must be met for the clinical dietary counseling emphasis. Background in nutritional biochemistry at the undergraduate level is recommended.

(4). Homemaker Rehabilitation — A program to prepare home economists for working with the disabled. A practicum and an internship are included in the curriculum. A bachelor's degree in home economics is required of all applicants.

To enter as a degree candidate in the graduate program, an applicant must have a bachelor's degree from an accredited institution and sufficient background in the area of specialization to qualify for admission to graduate courses in that area. Students with inadequate backgrounds will be required to take additional course work which will not apply to the master's program.

Each graduate student will be assigned an adviser. A graduate guidance committee will be selected by the student and the adviser. This committee shall consist of a minimum of three members, at least two of whom must be members of the graduate faculty of the University and the faculty of Family Resources.

Students pursuing a Master's degree in Family Resources will have a choice of the following three options:

(A). Thirty-six semester hours, of which 6 semester hours will be thesis credit. The graduate guidance committee will be consulted by the student selecting a thesis topic and in completing the thesis requirement. Approval of the thesis, following an oral examination by the graduate guidance committee of the student, will be required before the degree is granted.

(B). Thirty-six semester hours, of which 3 semester hours is a written research report to be submitted to student's committee before written comprehensive examinations.

(C). Thirty-six semester hours of course work followed by written comprehensive examinations.

After the student has completed 12 semester hours a program graduate guidance committee will review the course work for academic performance with reference to admission to candidacy for the Master of Science degree.

Additional credit hours may be required (beyond the above minimum requirements) by the graduate guidance committee if the committee determines a need for further strength in specific areas.

Approval in writing must be secured in advance from the student's committee to elect graduate courses offered at other institutions or off-campus with final approval by the Dean of the Graduate School.

Child Development; Family Relations

CDFR

244. *Family and Individual in the Community*. I, S. 3 hr. PR: One course in the family or sociology/anthropology, or consent. Social psychological analysis of the individual in the family and in other social systems. Study of role relationships, community processes and attitudes and values as they affect the behavior of individual.

245. *Family Development*. II, S. 3 hr. PR: CDFR 144 or consent. Family development in cross-cultural and historical perspectives. The contemporary family with special attention to social class differences and use of life cycle and developmental task concepts as analytic tools.
246. *Adolescent Development*. II. 3 hr. PR: CDFR 141, 142. Adolescent in contemporary American culture, including normative physical, social, and personality development; relationships within various typical social settings (e.g., family, school, community, peer group).
284. *Special Topics in Child Development*. I, S. 1-4 hr. per sem. PR: Written consent.
288. *Special Topics in Family Relations*. II, S. 1-4 hr. per sem. PR: Written consent.
341. *Cognitive Development of the Child*. I, S. 3 hr. PR: CDFR 141 and 142 or consent. Piaget's basic theory, including his view of perceptual, symbolic, motor and logico-mathematical development, across the life span. (*Offered alternate odd years in Summer.*)
343. *Language Development in the Child*. I. 3 hr. PR: Consent. Investigation of the origins and acquisitions of language in children with an emphasis on research and the theoretical issue that explains language as part of man's general cognitive functioning.
345. *Socio-Emotional Development of the Child*. II, S. 3 hr. PR: CDFR 141 and 142 or consent. A study and examination of contemporary theory and research into various facets of the socialization process in infancy and childhood. (*Offered alternate even years in the Summer.*)
347. *Comparative Study of the Family*. I, II. 3 hr. PR: CDFR 144 or consent. The comparative method as a framework for family analysis. The family as both an independent and dependent variable in social change. Alternative methods for achieving similar cultural objectives. Converging patterns in the contemporary world setting.
348. *Theories of Child Development*. S. 3 hr. PR: CDFR 141 or consent. Examination of major theoretical conceptions of child development. Work of Werner, Piaget, Freud, Erikson, and the American learning theorists compared and contrasted.
384. *Special Topics in Child Development*. II, S. 1-4 hr. per sem. PR: Written consent.
388. *Special Topics in Family Relations*. I, S. 1-4 hr. sem. PR: Written consent.

Family Resources — Research

390. *Research Methods in Family Resources*. I, II. 3 hr. PR: Introductory statistics or written consent. Research methodology, experimental design, and statistical analysis as relevant to problems in home economics. Required for all master's candidates in the Division.
391. *Assigned Topics*. I, II, S. 1-6 hr. per sem.; max. 9 hr. Required of all students writing theses.
490. *Teaching Practicum*. I, II. 1-3 hr. PR: Consent. Supervised practices in college teaching of home economics.
491. *Advanced Study*. I, II, S. 1-6 hr. PR: Consent. Investigation in advanced subjects which are not covered in regularly scheduled courses. Study may be independent or through specially scheduled lectures.
492. *Specialized Seminar in Home Economics Education*. S. 1-3 hr. PR: Consent.
493. *Specialized Seminar in Child Development and Family Relations*. S. 1-3 hr. PR: Consent.
495. *Specialized Seminar in Rehabilitation*. S. 1-3 hr. PR: Consent.

496. *Graduate Seminar*. I, II. 1 hr. PR: Consent. Each graduate student will present at least one seminar to the assembled faculty and graduate student body of the student's program.
497. *Research*. I, II, S. 1-15 hr.
498. *Thesis*. I, II, S. 1-6 hr. PR: Consent.
499. *Graduate Colloquium*. I, II, S. 1-6 hr. PR: Consent. For graduate students not seeking course work credit but who wish to meet residence requirements, use the University's facilities, and participate in its academic and cultural programs.

Family Resources — Seminars

282. *Seminar in Clothing or Textiles*. I, II, S. 1-4 hr. per sem., max., 9 hr. PR: Written consent. Significant contemporary issues in clothing or textiles.
283. *Seminar in Housing and Design*. I, II, S. 1-4 hr. per sem.; max. 9 hr. PR: Written consent; 12 hr. housing and design courses. Significant contemporary issues in housing or design.
285. *Seminar in Foods and/or Institution Administration*. I, II, S. 1-4 hr. per sem.; max. 9 hr. PR: Written consent. Significant contemporary issues in foods and/or institution administration.
286. *Seminar in Home Management or Family Economics*. I, II, S. 1-4 hr. per sem.; max. 9 hr. PR: Written consent. Significant contemporary issues in home management or family economics.
287. *Seminar in Nutrition*. I, II, S. 1-4 hr. per sem.; max. 9 hr. PR: Written consent. Significant contemporary issues in nutrition.
387. *Special Topics*. I, II, S. 1-4 hr. per sem.; max. 9 hr. PR: Written consent. Review and discussion of recent progress and/or special problems in foods and nutrition research.

Foods; Institution Administration

FIA

257. *Food Systems Management IV*. I. 3 hr. PR: FIA 154 and 158. Clinical experience in food systems accounting, cost control, and employee management. Includes administrative experience, employee evaluation, counseling and training.
258. *Food Systems Management V*. II. 6 hr. PR: FIA 257 or consent. Experience under supervision in planning, production, cost control, and employee management in an institution. Selection of setting and type of experience determined by needs of students.
355. *Experimental Foods*. II. 3 hr. (Lec. and Lab.) PR: FIA 55, Chem. 131 or consent. Factors involved in food processing under various conditions.

Home Economics Education

H.E. Ed.

278. *Vocational Home Economics*. I, II. 3 hr. PR: Senior standing or consent. Develops an understanding of federal vocational legislation to enable an individual develop program proposals and implement programs in vocational education.
311. *Home Economics Curriculum*. I, II, S. 3 hr. PR: Experience in teaching home economics or consent. Theory and research in home economics curriculum. Change in existing programs and development of new programs.

312. *Supervision in Home Economics*. I, II, S. 3 hr. PR: Teaching experience and consent. For home economics teachers preparing to serve as supervising teachers in off-campus training centers.
313. *Evaluation in Home Economics*. I, II, S. 3 hr. PR: 30 hr. of family resources, 7 hr. of education or consent. Experience in devising, selecting, and using a variety of techniques for evaluating progress toward cognitive, affective, and psychomotor objectives in home economics.
314. *Adult Education*. I, II, S. 3 hr. PR: Consent. Psychology of adult learning, philosophy, types of programs to include organization, methods and techniques, and leadership training in working with adult groups.
381. *Special Topics in Home Economics Education*. I, II, S. 1-4 hr.; max. 9 hr. PR: Senior standing and written consent. Home economics education at secondary, college, and adult levels. Current research and trends in selected areas.
395. *Practicum: Supervision of Student Teachers*. I, II. 1-12 hr. PR: Degree and teaching certificate in home economics or consent.

Home Management; Family Economics

HMFE

261. *Consumer Economics*. II. 3 hr. PR: Econ. 51 or HMFE 161, or consent. Understanding the consumer's role in our economy. Study of research methods and techniques used to identify, understand, and solve consumer problems.
262. *Introduction to Homemaker Rehabilitation*. II. 3 hr. PR: Consent. A comprehensive coverage of the historical development, philosophy, legislation, community resources, research and professional literature provides a base of knowledge needed by the student to enter the field of homemaker rehabilitation.
363. *Community Resources for Disabled Homemakers*. I. 3 hr. Provides students with knowledge and skills needed to utilize other disciplines in the team approach to rehabilitating handicapped homemakers. Presentations by team members, such as physicians, nurses, counselors, therapists, social workers, etc.
364. *Home Management for Disabled Homemakers*. II. 3 hr. PR: HMFE 262 or consent. Provides students with skills to teach home management concepts related to the disabled homemaker in performance of household tasks. Emphasis on work simplification, body mechanics, equipment selection, and adaptation to promote independent living.
365. *Homemaker Rehabilitation Practicum*. I, II, S. 6 hr. PR: HMFE 363, 364; Rehab. Counsel. 300, 310, 312. Field experience under supervision designed to develop student's knowledge and skills needed for working in homemaker rehabilitation. A variety of settings, including 6 weeks of resident experience to allow working directly with clients.

Housing and Design

HD

233. *Decorative Arts I*. I. 3 hr. PR: 9 hr. HD. The decorative arts — antiquity to American periods.
234. *Decorative Arts II*. II. 3 hr. PR: HD 233. The decorative arts — American periods to present.
383. *Special Topics in Housing and Design*. I, II, S. 1-4 hr. per sem. PR: Written consent.

Nutrition

NTR

270. *Nutrition Education*. I. 2 hr. PR: NTR 71, 3 hr. in educational psychology, and consent. Problems and methods in nutrition education at all levels of society, and with various types of individuals and groups.
271. *Human Nutrition*. I. 3 hr. PR: NTR 71, physiology; Co-requisite, biochemistry. Role of food nutrients in physiological and biochemical processes of the body; nutritional needs of healthy individuals under ordinary conditions.
272. *Community Nutrition I*. II. 2-3 hr. PR: NTR 71 or consent. Beginning planning for community nutrition for individuals and families at various stages of life cycle. Roles of agencies and professional groups. Clinical experience in community facilities for 3rd credit hour optional.
273. *Community Nutrition II*. II. 3 hr. PR: NTR 71, NTR 272 or consent. Advanced course in public health nutrition, includes nutrition programs and factors in development of nutrition policy at the national and international levels.
275. *Clinical Nutrition I*. II. 3 hr. PR: Physiology, NTR 271. General aspects of nutritional care of the patient. Role of the clinical dietitian on health team. Basic methods and clinical experience of current concepts to problems of dietary management in dealing with diseases and stress.
276. *Clinical Nutrition II*. I. 4 hr. PR: NTR 271, 275. Adaptations of normal diet for more complex diseases whose prevention or treatment is largely influenced by diet. Clinical experience with patient care related to the condition will be concurrent with the didactic material.
277. *Clinical Nutrition III*. II. 6 hr. PR: NTR 271, 275, 276. Complex dietary treatment of disorders, involving several biological systems. Effects of hormonal and biochemical changes. Complete responsibility for dietary care of assigned patients.
278. *Dietetic Technical Writing and Evaluation*. I. 3 hr. PR: Stat. 101 or Stat. 311 and consent. Foods, nutrition, and dietetics information resources. Evaluation and interpretation of foods and nutrition data. Critical evaluation of various types of publications in the discipline and technical writing. Nutrient evaluation methods.
279. *Dietetics As a Profession*. II. 1 hr. PR: Consent. The professional role of the nutritionist in modern society, dealing with problems involving ethics, attitudes, and values, case study approach.
370. *Human Nutrition Concepts and Application*. I, S. 3 hr. PR: A course in basic nutrition and consent. Critical study of the nutrient evaluation methods and the nutrient requirements of the human in health and disease, and scope of its application.
387. *Special Topics*. I, II, S. 1-4 hr. per sem.; max. 9 hr. PR: Written consent. Review and discussion of recent progress and/or special problems in foods and nutrition research.
494. *Seminar in Human Nutrition*. I, II, S. 1-3 hr.

Textiles and Clothing

TC

224. *Flat Pattern Design*. I, II. 3 hr. PR: TC 22, 27, 123 or consent. Opportunity for creative expression and for understanding of pattern design through flat pattern. Costumes designed and constructed by the student.

225. *Tailoring*. I, II. 3 hr. PR: TC 22, 27, 224. Tailoring suits and coats. Emphasis on professional techniques, advanced fitting, and construction of garments.
226. *Advanced Fashion Design*. II. 3 hr. PR: TC 224 or consent. Art principles and fashion terminology explored to increase the ability to analyze costume designs. Examination of different sources of design inspiration. Techniques of drawing from a live fashion model and various media for costume design presentation.
227. *Advanced Textiles*. I, II. 3 hr. PR: TC 27, 127. Comparative characteristics of all textile fibers are presented. Physical and chemical properties are explained with reference to fiber morphology and/or manufacturing processes.
382. *Special Topics in Clothing or Textiles*. I, II, S. 1-4 hr. per sem.; PR: Written consent.

SPECIAL EDUCATION

The Special Education programs at the master's degree level are designed to prepare master-clinical teachers of special education children and/or to provide initial training for the preparation of future supervisors and administrators of public school special education programs.

The post-masters Special Education programs leading to the Certificate of Advanced Study and the Doctor of Education are individually prescribed programs designed to prepare supervisors, administrators, and researchers. The advanced training of graduates who major in special education at the doctoral level prepares them for positions in higher education.

Applicants who entered the master's degree level Special Education Teacher Certification programs in Mental Retardation, Specific Learning Disabilities, and Behavioral Disorders (K-12) after April 1, 1975, must complete approved programs which are based on the State Standards for Accreditation of Teacher Education Programs (June 1974).

Students who hold a valid Professional Teaching Certificate for Elementary Education or Early Childhood Education will be required to satisfy the following portions of the Special Education master's degree programs for certification in K-12 programs in mental retardation, behavioral disorders, and specific learning disabilities: the core area requirements, and the teaching certification area requirements for their program area.

Students who hold a valid Professional Teaching Certificate for any specialization other than elementary or early childhood will be required to satisfy the following portions of the Special Education master's degree programs for certification in K-12 programs in mental retardation, behavioral disorders, and specific learning disabilities: the core area requirements, the Teaching Certification area requirements for their program area, and 25 hours of the approved program in basic skills. Students may satisfy the basic skills component by making a score of 651 on the area examination, Education in the Elementary School of the National Teacher Examination, or by satisfying the approved program in basic skills.

Students who hold no valid Professional Teacher Certificate will be required to satisfy the following portions of the Special Education master's degree programs for certification in K-12 programs in mental retardation, behavioral disorders, and specific learning disabilities: the core area requirements, the teaching certification area requirements for their program area, 25 hours of the approved programs in basic skills, and 6 hours of professional education. Students may satisfy the basic skills component by making a score of 651 on the area examination, Education in the Elementary School of the National Teacher

Examination, or by satisfying the approved program in basic skills. The professional education component may be satisfied by the student by making a weighted score of 620 on the Commons Examination with a sub-total of 248 on the Professional Education and a weighted sub-total of 372 on General Education of the National Teacher Examination, or by satisfying the approved program in professional education.

Curriculum for Special Education

Master of Arts (36 Semester Hours Minimum)

A. Core Area Requirements

Hours

(12 Semester Hours in All Master Degree Programs)

Sp. Ed. 250 — Survey of Exceptional Children and Adults	3
Sp. Ed. 260 — Curriculum and Methods for Special Education	3
C&G 305 — Theory and Practice of Human Appraisal	3
Psych. 281 — Abnormal Psychology <i>or</i>	
Psych. 263 — Introduction to Personality <i>or</i>	
Psych. 264 — Psychology of Adjustment	3
SPA 387 — Special Topics	3
Total	15

B. Teaching Certification Mental Retardation Area Requirements

Sp. Ed. 255 — Introduction to Mental Retardation	3
Sp. Ed. 305 — Mathematics for the Mentally Retarded	3
Sp. Ed. 306 — Reading for Mentally Retarded Children	3
Sp. Ed. 487 — Practicum	3-6
Total	12-15
Elective Requirements Mental Retardation Area	6-9

C. Teaching Certification Learning Disabilities Area Requirements

Sp. Ed. 330 — Introduction to Specific Learning Disabilities	3
Sp. Ed. 331 — Evaluative Techniques in Specific Learning Disabilities	3
Sp. Ed. 332 — Teaching Strategies of Specific Learning Disabilities	3
Sp. Ed. 487 — Practicum	6
Rdng. 342 — Reading Diagnosis and Prescription in Learning Disabilities	3
Total	18
Elective Requirements Learning Disabilities Area	3

D. Teaching Certification Behavioral Disorders Area Requirements

Sp. Ed. 340 — Introduction to Behavioral Disorders	3
Sp. Ed. 341 — Behavioral Dynamics in the School and Community	3
Sp. Ed. 342 — Curriculum and Methods for the BD Child	3
Sp. Ed. 487 — Practicum	6
Total	15
Elective Requirements Behavioral Disorders Area	6

E. Problem or Thesis Area Requirements

Stat. 311 — Statistical Methods <i>or</i>	
Ed. Psych. 320 — Introduction to Research	3
Sp. Ed. 395 — Problem in Special Education <i>or</i>	
Sp. Ed. 497 — Research	3-6
Sp. Ed. 480 — Seminar	3
Total	9-12
Elective Requirements	12-15

F. Approved Electives

C&G 305, 464	
C&I 330, 333, 340, 438	
Ed. Found. 320, 340	
Ed. Psych. 300, 320, 330, 333, 341, 342, 343, 350, 420, 440, 450, 451	
Psych. 263, 264, 271, 281, 282, 322, 423	
Rdng. 283, 321, 324, 325, 330, 331, 340, 342.	
Sp. Ed. 262, 265, 271, 280, 281, 305, 306, 330, 331, 332, 340, 341, 342, 365, 381, 395, 480, 487, 496.	
Stat. 311, 312.	

Special Education

Sp.Ed.

250. *Survey of Exceptional Children and Adults*. I, II, S. 3 hr. PR: Consent. Introduction to all areas of exceptionality. Definition, psychological and educational characteristics, and social and vocational adjustment.
255. *Introduction to Mental Retardation*. I, II, S. 3 hr. PR: Consent. Historical, etiological, social, educational, and vocational aspects of mental retardation.
260. *Curriculum and Methods for Special Education*. I, II, S. 3 hr. PR: Sp. Ed. 250, 255 and/or consent. Organization of instruction and adaptation of teaching methods in the several curricula areas and the construction of materials.
262. *Curriculum and Methods for the Trainable Mentally Retarded*. I, II, S. 3 hr. PR: Sp. Ed. 250, 255 and/or consent. Analysis of special problems of curriculum development for the trainable child and adult and provisions for development of original construction of curricula materials. (*Course will not be offered 1978-79.*)
265. *Industrial Arts in Special Education*. II, S. 3 hr. Experimentation with industrial arts and crafts suitable for instruction in special education classes. Discussion of factors involved in selection and manipulation of such media as leather, plastics, ceramics, wood, and metal. (*Course will not be offered 1978-79.*)
271. *Curriculum, Materials, and Methods for Mentally Gifted*. I, II, S. 3 hr. History and philosophy, identification, curriculum, materials and methods of working with mentally gifted. (*Course will not be offered 1978-79.*)
280. *Student Teaching Clinical Experience in Special Education*. I, II, S. 1-6 hr. PR: Consent. Student teaching with the mentally retarded.
281. *Special Problems and Workshop in Special Education*. I, II, S. 2-4 hr. PR: Consent. To take care of credits for special workshops and short intensive unit course on methods, supervision, and other special topics.
305. *Mathematics for the Mentally Retarded*. I, S. 3 hr. PR: Consent. Materials and methods for teaching mathematics to the mentally retarded child.

306. *Reading for Mentally Retarded Children.* II, S. 3 hr. Designed especially for majors in special education. Emphasizes the techniques, methods, and materials most effective for teaching reading to mentally retarded.
330. *Introduction to Specific Learning Disabilities.* I, II, S. 3 hr. PR: Consent. Historical, etiological, educational, and legislative aspects of, and multidisciplinary approaches to, the learning disabled child.
331. *Evaluative Techniques in Specific Learning Disabilities.* I, II, S. 3 hr. PR: C&G 305 and consent. Administration, interpretation, report writing, and educational implications of selected testing procedures appropriate to the diagnosis of learning disabilities.
332. *Teaching Strategies of Specific Learning Disabilities.* I, II, S. 3 hr. PR: Sp. Ed. 330, consent. Curriculum planning, informal diagnosis, techniques, teaching strategies in specific areas, opportunities to use strategies in student designed programs. (*Course will not be offered Second Semester, 1978-79.*)
340. *Introduction to Behavioral Disorders.* I, II, S. 3 hr. PR: Consent. Historical trends in the education of the behaviorally disordered child. Educational and behavioral management techniques and trends for the future.
341. *Behavioral Dynamics in the School and Community.* I, II, S. 3 hr. PR: Consent. Theories of behavioral dynamics, including several distinct approaches, which relates to specific problems in the school, home, and community. Agencies available to the behaviorally disordered child and his family. (*Course will not be offered Second Semester, 1978-79.*)
342. *Curriculum and Methods for the Behaviorally Disordered Child.* I, II, S. 3 hr. PR: Consent. Development of appropriate curriculum based upon individual needs of the child. Practical application of a variety of methods used in the instruction of the behaviorally disordered child in the classroom. Research and data collection case studies. (*Course will not be offered First Semester, 1978-79.*)
365. *Administration and Supervision of Programs for Exceptional Children.* I, II, S. 3 hr. PR: Consent. Administration and supervision with attention to: selection and placement procedures; facilities and equipment; local, state, federal legislation; and philosophy and recent research. (*Course will not be offered Second Semester, 1978-79.*)
381. *Special Topics.* I, II, S. 1-6 hr. PR: Consent. Special topics or research in mental retardation and in exceptional children and adults.
395. *Problem in Special Education.* I, II, S. 3 hr. Research for master's degree in special education.
480. *Seminar.* I, II, S. 1-6 hr. PR: Consent. Special topics concerned with the educational, sociological, and psychological aspects of special education.
487. *Practicum.* I, II, S. 1-12 hr. PR: Consent. Internship, advanced student teaching and administration and supervision practicum.
496. *Project in Special Education.* I, II, S. 3-6 hr. Research for the program leading to the Certificate of Advanced Study in Special Education.
497. *Research.* I, II, S. 1-15 hr.

SPEECH PATHOLOGY AND AUDIOLOGY

Master of Science in Speech Pathology and Audiology

Applicants who possess a bachelor's degree from an accredited college or university may be admitted to a program leading to candidacy for the degree of Master of Science in Speech Pathology and Audiology, provided they:

1. Present evidence of ability to pursue graduate work successfully as measured by Graduate School and divisional standards for admission.
2. Attain an overall grade-point average of 3.0 or above as evidenced by an official transcript. This transcript must be made available to the Office of Admissions and Records and the Speech Pathology and Audiology Graduate Affairs Committee. Any deficiencies in undergraduate preparation will be made up either without credit or for additional credit required for the master of science degree.
3. Provide evidence of the personal qualities predictive of professional success through written letters of recommendation by three individuals in the academic community. These letters must be submitted to the Office of Admissions and Records with copies to the Speech Pathology and Audiology Graduate Affairs Committee.

Deadlines for submitting applications and the material requested in items 1-3 are March 1 for the Summer, June 1 for the First Semester, and November 1 for the Second Semester.

Of the applicants under consideration, the Speech Pathology and Audiology Graduate Affairs Committee will accept those who they believe will meet with success in the graduate program. The number of applicants accepted will depend upon the number of qualified applicants, the size of the Speech Pathology and Audiology graduate faculty, and the facilities available for acceptable academic, clinical, and research training.

If, at any time, the student's academic average falls below 3.0 or if the student has more than 5 semester hours of C or below, the student will be dismissed from the program with no probationary status. Once the student has taken 15 hours of Speech Pathology and Audiology courses, the academic and professional performance will be evaluated by the faculty at a preliminary evaluation.

Requirements for completion of the Master of Science degree in Speech Pathology and Audiology are:

1. A minimum of 42 semester hours of approved graduate courses in speech and hearing sciences, speech pathology, audiology, and other related areas as is required to attain professional competence. A minimum of 39 credit hours may be required of those graduate students on off-campus externships during their fourth semester. The student may elect to take up to 6 semester hours of thesis credit in attaining the 42- or 39-hour minimum. The student must achieve not less than a 3.0 average for all courses taken for credit toward the graduate degree.
2. Successful performance on comprehensive examinations according to Graduate School and divisional standards.
3. Demonstration of professional competence in speech and/or hearing as measured by fulfillment of the academic and clinical practicum requirements established by the faculty.
4. A minimum of four semesters is required for master's candidates with a background in speech and hearing. Two of these four semesters may include summer sessions. For candidates without a background in speech and hearing, a minimum of six semesters is required for completion of the master's degree.

Doctor of Education in Speech Pathology and Audiology

Programs for the Ed.D. in Speech Pathology and Audiology are tailored to meet the particular needs of students and their professions. Interested students should contact the Chairman of the Department of Speech Pathology and Audiology.

Accreditation

The Department of Speech Pathology and Audiology has been awarded accreditation from the Education and Training Board (ETB), American Boards of Examiners in Speech Pathology and Audiology, of the American Speech and Hearing Association. Accreditation was received for both the speech pathology and audiology training programs. The Speech Pathology and Audiology training programs at WVU are the only accredited programs in the state of West Virginia.

Speech Pathology and Audiology

SPA

- 210. *Manual Communication*. II. 3 hr. PR: Consent. Development of skills needed to communicate in sign language. Includes the manual alphabet, basic number concepts, and the basic vocabulary of traditional American signs.
- 220. *Audiological Assessment*. I, II. 4 hr. PR: Consent. Physics of acoustic signal production; introduction of basic audiometric techniques and interpretation.
- 222. *Hearing Conservation*. S. 2 hr. PR: SPA 220 or consent. Identification audiometry for infants, pre-school, and school-age children; hearing conservation in industry.
- 223. *Aural Rehabilitation*. II. 3 hr. PR: SPA 220 or consent. Rehabilitative approaches to management in the auditorially handicapped individual. Medical, audiological, and social aspects of rehabilitation. Procedures of speech reading and auditory training will be examined and evaluated.
- 241. *Introduction: Speech and Hearing Practicum*. I. 2 hr. PR: SPA 50 or consent. Routine clinical and administrative procedures in speech pathology and audiology presented, emphasizing observation, report writing, record keeping, equipment demonstration, and test administration, scoring, and interpretation.
- 250. *Survey of Oral Communication Disorders*. I, II, S. 3 hr. (Non-majors.) PR: Consent. Basic concepts and principles of the disorders of speech and their treatment. Orientation course for students majoring in speech communication, as well as teachers, school administrators, psychologists, and rehabilitation workers.
- 251. *Cleft Palate and Voice Disorders*. II. 3 hr. PR: SPA 50 or consent. Normal vocal production and embryological development of the face and palate considered. Nature and etiology of disorders of cleft palate and voice, diagnosis, and general goals of therapy are introduced.
- 252. *Stuttering*. I. 3 hr. PR: SPA 50. Development of normal fluency versus nonfluency examined in addition to the nature, etiology, theories, classification, and prognostic indicators of stuttering. General formal and informal assessment, treatment, and counseling procedures introduced.
- 253. *Cerebral Palsy and Aphasia*. I. 3 hr. PR: SPA 50 or consent. Speech and language disorders related to cerebral injury, with emphasis on nature and etiology of cerebral palsy and aphasia. Diagnosis and general goals of therapy introduced.
- 254. *Language Acquisition and Behavior*. I. 3 hr. Normal processes involved in the acquisition of language, including the development of phonological, semantic, and syntactical

systems. Application of these processes to the diagnosis and treatment of language disorders are included.

257. *Public School Clinical Programs*. II. 3 hr. PR: SPA 50 or consent. Organization and structure of clinical programs in public school settings. Discussion of state and federal regulations, case selection, scheduling, program planning, and other administrative matters.
263. *Preschool Deaf Child*. I, II. 3 hr. PR: Consent. Importance of early detection and education, language development of congenitally deaf child, and parents' role in early childhood education.
281. *Special Topics*. I, II, S. 1-6 hr. per sem. (Max. credit, 6 hr.) PR: Consent. Independent study in speech pathology, audiology, and speech and hearing sciences.
282. *Clinical Practice in Speech*. I, II, S. 1-6 hr. PR: Consent. Supervised diagnosis and therapy of speech disorders. (May be taken for a maximum of 3 semester hours per semester for undergraduate or graduate credit.)
283. *Clinical Practice in Audiology*. I, II, S. 1-6 hr. PR: Consent. Supervised diagnosis and therapy of hearing disorders. (May be taken for a maximum of 3 semester hours per semester for undergraduate or graduate credit.)
321. *Structure and Function of the Auditory System*. I. 3 hr. PR: Consent. Detailed study of the gross and microscopic anatomy of the auditory system, and detailed investigation of physiological aspects of auditory sensitivity and acuity.
322. *Advanced Audiological Assessment*. II. 3 hr. Various audiological techniques utilized in differential diagnosis of auditory dysfunctioning. Administration and interpretation of diagnostic techniques.
326. *Pediatric Audiology*. I. 3 hr. A study of the development of the auditory response and hearing problems of early childhood. Student will learn the construction and application of specialized assessment techniques suitable for the pediatric patient.
327. *Pathologies of the Auditory System*. S. 3 hr. PR: Consent. Investigation of the nature and etiology of auditory system pathologies from the external ear to the auditory cortex and their audiological manifestation.
330. *Industrial and Environmental Audiology*. S. 3 hr. A study of various noise parameters, instrumentation for noise measurement, and measurement techniques. Effects of noise on man and industrial hearing conservation procedures discussed.
340. *Experimental Phonetics*. II. 3 hr. PR: SPA 152 or consent. Discussion of contemporary topics in the speech and hearing sciences, including acoustic and physiological phonetics.
343. *Neurophysiological Basis of Speech and Language*. I. 3 hr. PR: SPA 154, 253, or consent. General and typographic anatomy of CNS, with special attention to motor and sensory systems as they apply to speech, hearing, and language.
344. *Neuropathologies of Speech and Language*. S. 3 hr. PR: SPA 343. Explores methods of identifying and treating speech and language problems associated with nonprogressive and progressive neurological disorders, including cerebral palsy, Parkinson's disease, multiple sclerosis, muscular dystrophy, amyotrophic lateral sclerosis, Bell's palsy, and myasthenia gravis.
351. *Advanced Voice Disorders*. I. 3 hr. PR: SPA 251 or consent. Management of vocal behavior involved in functional and organic voice disorders. Etiology and pathogenesis, clinical features, history taking and development of critical listening skills emphasized.
352. *Advanced Stuttering Disorders*. II. 3 hr. PR: SPA 252 or consent. Course content examines factual information and classifications of stuttering. Formal and informal diagnostic techniques and treatment procedures are detailed for individuals who

display primary, transitional and secondary stuttering behaviors. Patient and family counseling are reviewed.

354. *Language Disorders in Children*. S. 3 hr. PR: SPA 254. Explores assessment and remediation procedures for language disorders in children. Emphasizes "formal" and "informal" language tests, and various treatment approaches, including traditional methods, psycholinguistic teaching procedures and behavior modification techniques.
356. *Advanced Articulation Disorders*. II. 3 hr. PR: SPA 156 or consent. Explores the merits of various methods of assessing and treating articulation disorders. Prognostic indicators, behavior modification techniques, and distinctive feature analyses are emphasized.
382. *Advanced Clinical Practice in Speech*. I, II, S. 1-6 hr. PR: Consent. Emphasis on diagnosis of speech disorders and appropriate therapeutic follow-up. Patient staffing experience in a multi-disciplined environment.
383. *Advanced Clinical Practice in Audiology*. I, II, S. 1-6 hr. PR: Consent. (May be taken in conjunction with SPA 322.) Supervised experience in administration and interpretation of audiological evaluative procedures. Application of therapeutic techniques in aural rehabilitation.
387. *Special Topics*. I, II, S. 1-6 hr. PR: Consent. Open to graduate students in speech pathology and audiology who are pursuing independent problems in that field. (May be repeated.)
480. *Seminar*. I, II, S. 1-6 hr. PR: Consent. Topics vary from semester to semester to meet student needs. Organic speech impairment, speech pathology research, aural rehabilitation research, medical audiology research, etc.
497. *Research*. I, II, S. 1-15 hr.

TECHNOLOGY EDUCATION

The Technology Education program offers graduate programs leading to degrees of Master of Arts, Education Specialist, and Doctor of Education. This program is involved in the SREB Academic Common Market. Students from the southern region (ten southern states) should inquire about paying in-state tuition. (See page 18.)

Admission Requirements. All applicants must comply with the requirements of the Graduate School, the College of Human Resources and Education, and the Technology Education program. Admission to the doctoral program is contingent upon assessment of: (1) official transcripts of all higher education work attempted, and (2) a diagnostic interview which is held during the student's first semester of course work. The Miller's Analogy Test is required for admission to the master's program and the M.A. and Graduate Record Examinations are required for admission to the doctoral program.

Master of Arts

Option A¹ B¹ C¹ D¹

I. Core Courses

Hours

(All graduate programs designed by student and adviser to meet student's specific needs.)

Ed. Psych. 320 — Introduction to Research	3	3	3	3
Ed. Psych. 330 — Advanced Educational Measurement	3	3	3	3
and			and	
T.E. 383 — Interdisciplinary Seminar	3	3	3	3
T.E. 400 — Technology: Its History and Development	3	3	3	3
T.E. 404 — Readings in Technology and Culture	3	3	3	3
T.E. 498 — Thesis	0	0	0	0
and			and	
T.E. 300 — Contemporary Problems in Transportation	3	0	0	3
T.E. 301 — Technical Development in Transportation	3	0	0	3
or			or	
T.E. 310 — Contemporary Problems in Communication	0	3	0	3
T.E. 311 — Technical Development in Communication	0	3	0	3
or			or	
T.E. 320 — Contemporary Problems in Production	0	0	3	3
T.E. 321 — Technical Development in Production	0	0	3	3

Total 21 21 21 27

II. Electives 15 15 15 9

Total 36 36 36 36

Electives are selected from University offerings and must contribute to program objectives. Prior approval of the adviser is required.

A¹ — Transportation Systems Concentration.

B¹ — Communication Systems Concentration.

C¹ — Production Systems Concentration.

D¹ — One of the Above and Thesis.

Doctoral Program

The doctoral program is offered with an emphasis on the study of technology as a discipline base. This program is competency based and allows each student to individually design a program of study to meet career aspirations.

Technology Education

T.E.

280. *Special Problems and Workshops.* I, II, S. 1-6 hr. To provide credits for special workshops and short intensive unit courses on special topics.
300. *Contemporary Problems in Transportation.** 3 hr. Technical and social cultural problems related to efforts in the development and utilization of new and improved modes of transportation.
301. *Technical Developments in Transportation.** 3 hr. Selected developments in transportation technology. Principles, concepts, and processes fundamental to the design and development of transportation systems.

Courses marked with an asterisk () are offered on a planned sequence, i.e., fall, spring, or summer. Other courses are offered as required by student program designs.

310. *Contemporary Problems in Communication*. * 3 hr. Technical and social cultural problems related to efforts in the development and utilization of new and improved modes of communication.
311. *Technical Developments in Communication*. * 3 hr. Selected developments in communication technology; identification of principles, concepts, and processes fundamental to design and development of communication systems.
320. *Contemporary Problems in Production*. * 3 hr. Technical and social/cultural problems resulting from efforts in the development and utilization of new and improved methods of producing goods and services.
321. *Technical Developments in Production*. * 3 hr. Selected developments in production technology; identification of principles, concepts, and processes fundamental to the design and development of production systems.
330. *Contemporary Problems in Research and Development*. 3 hr. Research and investigation about transportation, communication, and production systems; technical and social/cultural problems related to research and development efforts.
350. *Industrial Arts Therapy*. I, II, S. 3 hr. Individualized instruction in industrial arts teaching techniques and therapeutic practices in rehabilitation of the handicapped.
373. *Professional Development*. I, II, S. 1-6 hr. PR: Consent. Specially designed experiences for those interested in advancing professional skills in the study of technology. May be repeated. Grade S or U. Not for degree credit in programs in the College of Human Resources and Education.
383. *Seminar*. * I, II, S. 1-6 hr.
385. *Practicum*. * I, II, S. 1-12 hr. PR: Consent.
390. *Special Topics*. I, II, S. 1-6 hr. PR: Consent.
400. *Technology: Its History and Development*. * 3 hr. Major technical periods in the civilization process and the interrelationships of technological developments to the social/cultural milieu.
401. *Curriculum Development and Physical Facility Design*. * I, II, S. 3 hr. PR: Consent. Development of curriculum components for education in the technologies and a study of the physical facility design requirements related to curricular implementation.
402. *Development of Instructional Materials*. * I, II, S. 3 hr. PR: Consent. Design and development of media and instructional units for education in the technologies.
403. *Design in Technology*. S. 3 hr. Study of the design of technical products and systems.
404. *Readings in Technology and Culture*. * 3 hr. Fundamental, historical, and contemporary ideas of the nature of technology as an area of created knowledge.
405. *Innovation and Invention*. * 3 hr. A study of the innovation and invention process.
480. *Projects in Technology Education*. * I, II, S. 1-6 hr. PR: Consent.
481. *Problems in Technology Education*. * I, II, S. 1-6 hr. PR: Consent.
490. *Teaching Practicum*. I, II, S. 3-12 hr. PR: Consent.
491. *Advanced Study*. I, II, S. 2-4 hr. PR: Consent.
496. *Graduate Seminar*. * I, II, S. 1-4 hr. PR: Consent.
497. *Research*. * I, II, S. 1-15 hr.
498. *Thesis*. I, II, S. 1-15 hr.
499. *Colloquim*. * I, II, S. 2-9 hr. PR: Consent.

Courses marked with an asterisk () are offered on a planned sequence, i.e., fall, spring, or summer. Other courses are offered as required by student program designs.

Interdisciplinary Programs

Genetics and Developmental Biology

The M.S. and Ph.D. degrees are offered in Genetics and Developmental Biology, an interdisciplinary program involving the faculty and facilities of a number of departments in the various colleges and schools of the University. A student may concentrate in Genetics or Developmental Biology. The areas in which specialization is offered are as follows: *Genetics*: Biochemical and molecular genetics, cytogenetics, developmental genetics, forest genetics, human genetics, plant genetics, population and quantitative genetics, and animal breeding; *Developmental Biology*: molecular aspects of development, experimental morphogenesis, teratology, regeneration, oncology, descriptive embryology, and life cycles of animal and plants.

The student may also minor in one or more other scientific fields.

The object of this program is to build upon a well rounded scientific foundation, a specialized knowledge of the concepts and methods in a discipline, chosen by the student, which will enable the student to pursue a productive career in teaching and/or research. Responsibility for a student's program is vested in a graduate committee charged with arranging the student's course work, conducting examinations, and supervising the research.

Basic training in mathematics, physics, chemistry, and biology is required for admission. Students lacking some prerequisites must fulfill them before graduation. Applications for graduate study should be sent in as early in the year as possible, but no later than April 1 for entry the following August. However, applications are accepted year-round for admission to the program in the following semester. Official transcripts of baccalaureate and/or master's degrees must be sent directly to the WVU Office of Admissions and Records. Three letters of recommendation from science teachers should accompany the application. Application forms can be received from the Office of Admissions and Records. For further information, write to the Chairperson.

Reproductive Physiology

The graduate program in Reproductive Physiology, leading to the M.S. and Ph.D. degrees, is interdisciplinary, with faculty located in the Departments of Anatomy, Animal and Veterinary Sciences, Biology, Internal Medicine, Obstetrics and Gynecology, Pharmacology, Plant Sciences, and Surgery. Requirements for admission include at least a 2.75 grade-point average (4.0 system) and completion of the following prerequisites with a grade of C or better in each: Calculus, genetics, organic chemistry, physics, and vertebrate embryology. It is recommended that applicants complete both the aptitude and the advanced tests of the Graduate Record Examination. Foreign languages are not required for a degree in Reproductive Physiology.

Research Areas: Function and regression of the corpus luteum, aging of the oocyte in abnormalities of development, control of postpartum reproductive performance, metabolism and steroid receptors of male sex accessory tissue, environmental factors in reproduction, control of steroidogenesis, control of estrus and ovulation, use of artificial insemination, behavior aspects of reproduction, endocrine function of vasoactive polypeptides, and role of prostaglandins in reproduction.

Research can involve farm animals, laboratory species, and human beings. The program draws on courses offered in various departments and should include work in endocrinology, advanced reproductive physiology, biochemistry, physiology, statistics, and developmental embryology.

African Studies

Since 1967, the University has expanded its technical and academic competence regarding Africa from solely the agricultural sciences to include the social sciences and humanities. The Colleges of Agriculture and Forestry, Arts and Sciences, Business and Economics, Engineering, Human Resources and Education, and the Creative Arts Center, are involved in teaching and research in African and Africa-related subjects.

The Committee on African Studies was organized in 1969, in cooperation with the WVU Office of International Programs, to fulfill two basic requirements: (1) to blend the agricultural expertise of long standing with the newer programs of study and research into unified course offerings and systematic research; and (2) to make available, to existing and prospective University programs of African technical assistance, knowledge in the social sciences and the arts.

Moreover, it is within the committee's mandate to broaden its activities to include other parts of the world experiencing problems of development and human change similar to those of Africa. Although WVU programs have been related significantly to East Africa, they have a wider application. The concepts and philosophy developed in all of these activities can be utilized throughout Africa and, with suitable modification, could benefit other developing areas of the world, including the Appalachian region.

The Africana library collection contains approximately 7,000 volumes, exclusive of periodicals, and is capable of supporting undergraduate and graduate research up to and including the doctoral level within several natural and social sciences.

The committee does not offer undergraduate or graduate degrees in African studies as such, but rather stimulates, in students who are formally associated with departments in the natural and social sciences and the humanities, the interdisciplinary study of Africa and development.

In 1970, the graduate program in Public Administration was expanded to include an option in development administration. The effect of this is to ally the Committee on African Studies and its curriculum with the Public Administration Program. Students completing the option are awarded the M.P.A. degree with an interdisciplinary concentration in the area of African and development studies.

The Committee provides opportunities for special nondegree study in Africa-related subjects and works to develop international study programs in Africa for University faculty and students.

Further information concerning the African Studies program may be obtained from: Rodger D. Yeager, Coordinator, Office of International Programs, 2112 Agricultural Sciences Building.

African and Related Graduate Courses of Study

COLLEGE OF ARTS AND SCIENCES

Department of English

English 286 — Black American Fiction

Department of History

Hist. 227 — East Africa to 1895
Hist. 228 — East Africa Since 1895
Hist. 229 — History of Africa: Pre-Colonial
Hist. 230 — History of Africa: European Dominance to Independence
Hist. 251 — History of Black People in America to 1900
Hist. 252 — History of Black People in America Since 1900
Hist. 426 — Seminar in African History

Department of Political Science

Pol. Sci. 258 — Politics of Africa
Pol. Sci. 351 — Politics of Planned Development
Pol. Sci. 459 — Seminar in Comparative Government

Department of Sociology and Anthropology

S.A. 223 — Sociology of Rural Life
S.A. 240 — Social Change
S.A. 241 — Population Dynamics
S.A. 251 — Cultural Dynamics
S.A. 290 — Special Topics

COLLEGE OF BUSINESS AND ECONOMICS

Econ. 213 — Economic Development

CREATIVE ARTS CENTER

Division of Music

Music 230 — Music of Africa

Journalism

The Master of Science in Journalism program is designed to help persons involved in the various aspects of mass communications better understand and cope not only with the increased complexity of their own field, but also with fields outside mass communications.

Specifically, the program is designed to help each student reach full potential as a worker, teacher, or scholar in mass communications. The program is designed not only to prepare a student for a first job — although students who obtain the M.S.J. degree should excel in the skills of the profession — but also to prepare for long-term and productive career development through the study of history, literature, problems, trends, law and ethics, theory and research methods of mass communications, and through the study of related fields.

The M.S.J. program is intended to: (1) afford the liberal arts graduate an opportunity to concentrate advanced study in mass communication; (2) provide intensive study for persons who have undergraduate journalism training, but who wish to pool their journalistic skills with extensive knowledge in another substantive area or areas (e.g., political science, economics, science); and (3) give persons who have had considerable professional experience an opportunity to broaden their academic bases through carefully selected advanced studies.

Admissions and Advising

Admission to the M.S.J. program is limited to holders of baccalaureate or equivalent degrees from accredited institutions of higher learning. Applicants should have combined (verbal and quantitative portions) Graduate Record Examination (GRE) Aptitude Test scores of at least 1000 and overall grade-point averages (GPA) of at least 3.0 (on a 4.0 scale). Each applicant also should submit (to the director of graduate studies in the School of Journalism) a detailed essay explaining why the student wants to undertake graduate study in journalism, what the student hopes to get from the graduate journalism program, what the long-term goals are, and how graduate education in journalism can help achieve those goals.

An applicant who doesn't meet the minimum GRE and/or GPA requirement(s) may be accepted only if the low GPA and/or GRE scores are offset by other factors. Excellent recommendations, unusual grading patterns (e.g., a steady rise of grades), an outstanding statement of purpose, or examples of professional accomplishment sometimes can offset low GRE scores or a low GPA.

Students applying for admission to the M.S.J. program are encouraged to send non-returnable supporting materials to the director of graduate studies in the School of Journalism. Examples of published or unpublished writing, research or photography; a detailed listing of professional media experience or other relevant job experience; and other supporting materials will be considered by the admissions committee. All other materials (e.g., transcripts, GRE scores, application forms) should be sent to the Office of Admissions and Records.

A student who does not have a bachelor's degree in journalism or extensive professional experience must meet these additional requirements:

1. Must have completed a core of journalism courses, with subjects and grades acceptable to the School of Journalism, *or*
2. Must complete undergraduate journalism and other courses to be prescribed by the School of Journalism, *or*
3. Must demonstrate knowledge and competence in a number of journalism topics to be prescribed by the School of Journalism, *or*
4. Must meet a combination of the foregoing requirements.

All applications for admission will be considered by the director of graduate studies, one faculty member of the Graduate Studies Committee (GSC), and one student member of the committee. The faculty member of the GSC will have expertise in the area in which the potential student wishes to specialize. The application of a student interested in advertising, for instance, will be considered by the director of graduate studies, the student GSC member, and the faculty GSC member who has expertise in advertising. The Graduate Studies Committee will consider special cases and appeals.

The director of graduate studies will advise all students about general problems and concerns, and a faculty resource person will be appointed as a consultant at the time each student is accepted into the program. Students who wish to "major" in public relations, for instance, will have a faculty resource person from that area. Students should consult the faculty resource persons primarily for information about courses to take, projects to undertake, special training to obtain, and appropriate outside areas for study in the area of specialization (e.g., news-editorial, public relations, advertising, broadcasting, history, fund raising).

Early in the student's program, usually by the completion of 6-9 credit hours of graduate course work, the student, the adviser and the resource person will draw up a plan of study that will show the direction of the student's course work.

The plan may also indicate a general time frame anticipated for the completion of this work and may contain the direction and outline of the research problem to be undertaken. This plan of study will become a part of the student's record, and will constitute, with some degree of specificity, the terms and conditions that the student must meet for completing the degree requirements. Subsequent changes in the plan of study must be approved by the student, the adviser, and the resource person.

A writing proficiency examination, administered by the Journalism 300 instructor, will be given twice during the course. Students who fail it the first time will receive counseling on their writing weaknesses and must pass the test the second time it is given to continue their journalism graduate studies.

Graduate Assistantships and Internships

Approximately four assistantships and 10 internships are available in the School of Journalism each year. Graduate assistants typically teach classes, handle labs, and assist senior professors with their courses. Interns typically work in mass communications-related jobs on campus to obtain solid professional experience.

Students receive stipends of approximately \$2,300 for the academic year and tuition remission for the entire year. Although sometimes renewed for a second year, assistantships and internships are granted for one academic year. Graduate assistants and interns typically work an average of 15 hours per week during the academic year.

Persons who want to be considered for assistantships or internships should have their applications on file with the director of graduate studies in the School of Journalism before March 1.

Program Requirements

The School of Journalism offers two tracks — the thesis track and the professional track — within the M.S.J. program.

The thesis track is generally a teaching-research program for persons who want to go on for a Ph.D. degree, teach in a community college, or conduct research in some areas of mass communications. Persons in the thesis track normally take research and theory courses both inside and outside the School of Journalism, statistics, and social science courses. The program culminates in a thesis, which is a scholarly study of an important aspect of mass communications.

The professional track is designed primarily for persons who wish to become excellent practitioners in some field of mass communications and who have little desire to teach or become mass communications scholars. Persons in the professional project track normally take communications and outside area courses that will help them become better practitioners. The program culminates in a professional project, which helps a student extend the student's knowledge about a given aspect of mass communications but which could be the sort of non-routine project on which the student might work as a professional.

Course Work

For the master's degree in journalism, the student must meet the following requirements:

Thesis Research Program. A minimum of 30 semester hours of acceptable graduate credit, including a thesis for 6 hours of credit.

(a) As part of the 30 hours, a minimum of 18 hours, including the thesis, in School of Journalism courses.

(b) Included in the 30 hours, a minimum of 9 hours in a minor conducted outside the School of Journalism.

Professional Program. A minimum of 30 semester hours of acceptable graduate credit, including a professional project for 6 hours of credit.

(a) As part of the 30 hours, a minimum of 18 hours, including the professional project, in School of Journalism courses.

(b) Included in the 30 hours, a minimum of 9 hours in a minor conducted outside the School of Journalism.

In either program, the candidate is allowed to take more than the minimum required number of hours.

Upper-Level Courses Required. In both programs, *60 percent* of the graduate credits submitted for the degree must be in courses numbered *300 or above*.

Grades. Course work must be completed with a minimum grade-point average of 3.0. The thesis and professional project will be graded as S or U (satisfactory or unsatisfactory).

Examination. The candidate for the master's degree will pass an oral examination on the thesis or professional project. In addition, the thesis or professional project will be evaluated as a test of the candidate's writing skill.

The kinds of courses taken in the M.S.J. program largely depend on each student's background and interests. The program is intended to accommodate students of differing academic and professional backgrounds and interests, and there are several "sequences" in which students may specialize.

A student typically will take all outside courses in one area (e.g., biology, political science, history), although the student may decide after consultation with the adviser to take courses in two or more outside areas. Courses outside the School of Journalism are selected by students *in consultation with their advisers*; outside courses selected, of course, are subject to the availability of space and prerequisite requirements in the offering departments.

Thesis/Professional Project

Each student must complete a thesis or professional project involving original work in the student's area of interest. *The student must have a thesis or professional project proposal written and a guidance committee selected by the end of the semester in which the first 12 hours of course work are completed.*

Each student is responsible for developing ideas for the thesis or project. Through consultations with members of the journalism faculty, the student determines faculty interests and areas of expertise, and ideas are refined to the point where the student has a significant and feasible idea in mind.

The student, with the approval of the Graduate Studies Committee, selects the journalism faculty member who would be best able to chair the advisory committee, subject to the agreement of the faculty member. If questions arise as to a faculty member's interest or knowledge, the student should find answers by direct inquiry to the faculty member or by consultation with the academic adviser or other members of the Graduate Studies Committee.

With the chairperson, the student further refines the project idea to a "preliminary proposal" stage, in which ideas and appropriate methodology are on paper, but not necessarily in formal proposal form.

After the student has written a preliminary proposal and selected a faculty chairperson, the student should select other members of the advisory committee, subject to their willingness to serve. *The advisory committee must consist of not*

fewer than four members, one from outside the School of Journalism; two persons must be members of the WVU graduate faculty.

Working under the guidance of the advisory committee, the student prepares a complete thesis or project proposal, extended from the preliminary proposal. Guidance for preparing a proposal is available from the director of graduate studies.

The student then has a consultative meeting, during which final revisions of and refinements in the proposal are discussed with the members of the advisory committee. Notices of the public meeting (to which students are invited) must be placed in the boxes of all members of the School of Journalism faculty and posted outside the Dean's office at least two weeks before the meeting. Two copies of the thesis or project proposal must be placed on reserve in the journalism reading room.

After the consultation, the committee votes to accept or reject the proposal. The student then works closely with the committee in the completion of the thesis or project. All committee members should be kept informed and consulted for advice (as needed and as desired by them) as the thesis or project develops.

After each member of the advisory committee is satisfied with the work, a public oral examination is scheduled. Two weeks' notice must be given to all faculty of the School of Journalism (notices should be placed in all faculty boxes and posted outside the Dean's office). Two copies of the final thesis or project must be placed on reserve in the journalism reading room. Students also should file their shuttle sheets with the Graduate School two weeks before the date of the oral defense.

Only committee members may vote on acceptance or rejection of a thesis or project. A majority vote is sufficient to approve the thesis or project, although a dissenting vote may be recorded. Furthermore, at least three signatures (two of which must be signatures of graduate faculty members) must be on the approval sheet. If one committee member is outvoted and feels he/she cannot sign the approval sheet, he/she may resign from the committee. Such action may force a reconstitution of the committee and repetition of earlier mentioned steps leading to the oral examination.

The chairperson of the advisory committee will decide whether final corrections (after the oral examination) have been made properly, and he/she will check the style and form of the final typed version. The *MLA Stylesheet* should be carefully followed during preparation of a thesis or professional project.

Two copies of the final thesis or project should be delivered to the School of Journalism, two to the Graduate School, and one to each member of the advisory committee.

Maintenance of Scholarship

All students are expected to maintain satisfactory progress toward the degree. A student's graduate record begins with the first course credited to the degree and includes all subsequent courses. All students must maintain a grade-point average of at least 3.0 and complete all requirements within seven years. Students who fail to meet this standard will be dropped from the program permanently.

Each student working toward the M.S.J. degree must register for at least one semester hour each regular (Fall and Spring) semester. This enrollment may be in course work or in Journalism 497.

Foreign Students

Believing that mutual benefit is derived when students from other countries study in the WVU School of Journalism, the School welcomes foreign students. At the same time, the School recognizes that journalism, more than many other fields, requires language skill. To profit by journalism study and practice in the English language environment, foreign students must have a ready understanding of the American language idiom in English. They will be called on to follow rapid speech in interviews, press conferences, public addresses, and in the classroom, as well as to deal with abstract ideas communicated in English. Award of the master's degree in journalism attests to the student's facility in English. Moreover, in graduate study, foreign students must maintain the same 3.0 grade-point average required of other students.

Recognizing the language difficulty, the School of Journalism offers foreign students a transition semester. Unless students obviously are fluent in English and pass a test in which they demonstrate comprehensive knowledge of English fundamentals (grammar, punctuation, syntax, spelling), they will be offered a semester of undergraduate study (not for graduate credit), which will enable them to sharpen language skills. Such a transitional semester also will permit foreign students to study other selected courses in preparation for graduate study. These courses will help them adapt to the American system of journalism and to the new cultural environment.

Journalism

Journ.

- 203. *Media Management and Promotion*. I, II, S. 3 hr. PR: Journ. 113 and 115. Problems, functions, and responsibilities in communications media organization, operation, management, and promotion. Special emphasis on case study of media management and promotion in the Appalachian area.
- 204. *Advertising Markets and Media*. I, II, S. 3 hr. PR: Journ. 113. Advertising planning, buying, and scheduling by advertisers, media, and advertising agencies on national and local levels. Seminar discussions and assignments; special emphasis on problems related to Appalachian markets and media.
- 210. *Advertising Production*. II. 3 hr. PR: Journ. 110. Techniques and mechanics of producing print advertising. Art, typography, printing processes, layout, make-up, and scheduling.
- 220. *Writing for Magazines*. I, II. 3 hr. PR: Upper-division or graduate standing; Journ. 18 or equiv. preparation in grammar, punctuation, and spelling. Professional approach: magazine analysis, query letters, writing, rewriting; submitting manuscripts for publication.
- 221. *Public Relations Interning*. I, II. 3 hr. PR: Journ. 122 and 123. Open only to junior, senior, and graduate public relations majors. Student learns through on-the-job training and from reports of those who have on-the-job experience. Course structured along a public relations agency organization and operations.
- 222. *Public Relations Case Studies*. II. 3 hr. PR: Journ. 122 or 123. Seminar based on in-depth studies of public relations programs developed and applied in support of our institutions. Primary emphasis on successful campaigns, but unsuccessful efforts also will be examined for causes of failures.

227. *History of Journalism*. I, II, S. 3 hr. PR: Hist. 52 and 53 or consent. Open to all University students. Impact of the American press on the nation; development of today's media from the beginnings in seventeenth century England and in the American colonies; great names in journalism; freedom of press and its current implications.
228. *Law of the News Media*. II. 3 hr. For seniors and graduate students. The law as it affects the mass media. Considered are such areas as libel, public records, criminal pre-trial publicity, freedom of information, obscenity.
230. *Editorial and Critical Writing*. I. 3 hr. Open to all University students. The student will analyze and write editorials and commentaries; study typical editorial pages and the ethics governing editorial page content; become familiar with libel, privacy, contempt, and other problems — operating and political — as they arise.
231. *Color Photography*. II. 3 hr. PR: Journ. 120 and 130 or consent. The theory of color slides and prints, including slide development, as applied to multi-media presentations for advertising and public relations. (Supplies will cost \$50.00-75.00.)
251. *Direct Mail Advertising*. I. 3 hr. PR: Journ. 113 and 114 or consent. Mailing, marketing, and creation of direct mail letters, brochures, involvement pieces, and reply cards. Postal regulations, direct mail law, and printing procedures. Two lec., one lab.
284. *Public Affairs Reporting by Television*. I, II. 3 hr. PR: Journ. 183 and consent. Preparation and presentation of public issues via television. Methods of topic selection, research, organization of ideas and script development, alternate formats, ethical and legal constraints.
285. *Special Topics in Broadcast Journalism*. I, II. 1-3 hr. PR: Consent. Directed investigation of selected topics in broadcast journalism. (Repeatable up to 6 hr.)
286. *Radio and Television Advertising*. I. 3 hr. PR: Journ. 113 and consent. Radio and television writing techniques. Media planning, buying; market analysis. Federal regulations affecting advertising.
289. *Documentary Motion Picture Production*. II. 3 hr. PR: Journ. 189 and 281 or Sp. Com. 184 or 280. In-depth development of the techniques and resources utilized in the production of a complete documentary motion picture. Films, processing, cinematography, editing, research, writing, music, narration. Lab oriented. It may be necessary for students to pay for camera rental and for their own film stock and film processing.
299. *Contemporary Media Issues and Ethics*. I, II. 3 hr. Required of all senior journalism majors. In-depth study of contemporary media issues such as right of access to media, morality in news and advertising, new FTC and FCC regulations, media responsibility to society, social responsibility of media professionals. Individual research papers on issues with ethical considerations.
300. *Introduction to Graduate Studies*. I. (No Credit.) Required of all graduate students; non-credit course designed to orient students to graduate study. (Class meets one hour a week.)
302. *Seminar in Communications Theory*. I. 3 hr. PR: Studies in human behavior. Communications theory drawing heavily on social psychology and sociology/anthropology. Philosophy of science. Theory as scientific knowledge. Characteristics of theory. Begin learning how to draw on experts, to apply theory.
312. *Fund-Raising and Foundation Management*. I. 3-6 hr. Open to graduate students and to seniors with 3.0; consent. Seminar. Studies in fund-raising, alumni relations, and foundation management.
315. *Seminar in Journalism Education*. I, S. 1-3 hr. Journalism education problems. Each student does an individual research project planned to provide for professional development as a journalism teacher. Emphasis on secondary school problems.

337. *Eighteenth Century Journalism: American*. I. 3 hr. Role of Colonial journals in reducing regionalism and in forging a nation; in-depth study of selected journals; patterns of interrelationships among publications; the press during the Revolutionary years.
338. *Eighteenth Century Journalism: European*. II. 3 hr. Examination of British periodicals and their impact on political, cultural, and economic patterns of the century; study of selected journals; contributions and characteristics of Continental periodicals and their forerunners.
339. *Seminar in Advanced Advertising Management Problems*. II. 3 hr. Recently developed ideas and techniques in advertising, advertising research, and media management.
341. *Special Topics*. I, II, S. 1-6 hr.
343. *International Communications*. I. 3 hr. International news gathering and dissemination — including wire services, broadcast satellites, and political barriers — will be examined, particularly as these factors affect a free exchange of information within the world community. Efforts by the United Nations to encourage news exchange and to lower news barriers will be a major case examination.
344. *Seminar in the Foreign Press*. II. 3 hr. Studies in legal and communications problems of the international flow of news and opinion; international press codes; communications media of major countries.
380. *Thesis*. I, II, S. 2-6 hr.
390. *Professional Project*. I, II, S. 2-6 hr. Non-thesis professional project for students preparing for some field in mass communications.
401. *Research Methods*. 3 hr. Study of quantitative methods common to research in communications. An introduction to sampling, measurement, analytic procedures and data collection as applied to communications research and practical journalistic problems. Critical evaluation of communications research reports.
402. *Seminar in Research Methods*. 3 hr. Advanced study of methodological techniques. Research project chosen from area of student's major interest. Written report of study undertaken required.
422. *Seminar*. I, II, S. 1-4 hr.
490. *Teaching Practicum*. I, II, S. 1-3 hr.
491. *Advanced Study*. I, II, S. 1-6 hr. PR: Consent. Investigation in advanced subjects which are not covered in regularly scheduled courses. Study may be independent or through specially scheduled lectures.
497. *Research*. I, II, S. 1-15 hr.
499. *Graduate Colloquium*. I, II, S. 1-6 hr. PR: Consent. For graduate students not seeking course work credit but who wish to meet residence requirements, use the University's facilities and participate in its academic and cultural programs.

Medical Center Basic Sciences Programs

Anatomy

The Department of Anatomy offers graduate programs which are committed to the training of competent researchers and capable teachers. This is accomplished by the completion of a carefully designed plan of study tailored to the individual

student's interests. The program begins with instruction in basic morphological, developmental, and functional aspects of human anatomy. Additional related course work and electives are required. These selected courses strengthen the area of interest of the student. The student then conducts an original research project which culminates in a dissertation (Ph.D.) or a thesis (M.S.).

Admission Requirements

In addition to the admission procedure of the Graduate School, the Department of Anatomy requests that each applicant complete a departmental application form, obtained from the department. After an application is favorably reviewed by the departmental Graduate Committee, applicants are invited for a personal interview whenever practical. The applicant is admitted by a majority vote of the departmental faculty.

It is recommended that the following courses be completed before entering the graduate program: Algebra, trigonometry, general physics, inorganic and organic chemistry, general biology or zoology, comparative anatomy, embryology, genetics, cell biology or general physiology, and two years of French, German, or Russian. At the discretion of the department, a student may be allowed to complete a limited number of prerequisites after enrolling in the program. A grade-point average above 3.0 is desirable. The aptitude portion and an advanced section of the Graduate Record Examination are generally required. Also, three letters of recommendation from persons who can best evaluate the applicant's potential for graduate study should either accompany the application or be mailed to the Department of Anatomy separately. Applicants who desire consideration for financial aid should complete the application process before January 15.

Doctor of Philosophy

The first year of study is usually occupied with required course work within the Department of Anatomy. These courses include gross anatomy, microanatomy, neurobiology, introduction to research, and seminar in anatomy. Required courses in other basic medical sciences, such as biochemistry and physiology, are usually taken in the second year. Twelve hours of additional graduate-level courses are also required. These requirements will have been satisfied when the student earns a grade of at least B in each of the courses taken in the Department of Anatomy and has maintained a 2.75 overall grade-point average as required by the Graduate School.

To be admitted to candidacy for the Ph.D. degree the student must satisfy the above requirements, demonstrate a reading knowledge of one foreign language, pass a written and oral comprehensive preliminary examination, and prepare a plan for a research project to be undertaken for the dissertation. To be recommended for the Ph.D. degree each student must complete a dissertation based on original research and defend the dissertation at an oral examination.

This program allows flexibility for each student. The precise plan of study is designed by the student and an Advisory Committee, which is composed of faculty members selected by the student.

The student often culminates the training period with presentations at regional and/or national scientific meetings. The Southern Society of Anatomists and the American Association of Anatomists are the most suitable meetings for this purpose.

Master of Science

The master's program in Anatomy is offered as a terminal degree only for students in certain specialized fields, such as physical therapy or in a conjoint program in dentistry or medicine. It is not necessary for the student to complete the M.S. degree in order to qualify for admission into the Ph.D. program, although the student may elect to complete the requirements for this degree in progress toward the Ph.D.

An applicant who shows a special need for the M.S. degree must generally be as well qualified as applicants for the doctoral program. The M.S. student must complete courses in gross anatomy and microanatomy plus 6 to 9 hours of required and elective courses. A 2.75 grade-point average must be maintained. In addition to course work the student must complete a thesis based on original research and defend the thesis at an oral comprehensive examination.

Research and Instruction

Research Areas — Gross Anatomy: Anatomical variations and anomalies, and electromyographic studies of specific muscle groups. Microscopic Anatomy: Studies of cells, tissues and organs, under normal and experimental conditions with histochemical, electron microscopic, autoradiographic, and fluorescent techniques. Developmental Anatomy: Experimental and descriptive embryology, cellular differentiation, and dedifferentiation, regeneration and the effects of drugs and other environmental agents on development. Neuroanatomy: Experimental, comparative, and embryological studies of specific nerve cell groups and nerve pathways in the spinal cord, brain stem, cerebellum, and cerebrum.

Anatomy

Anat.

101. *Principles of Human Anatomy.* (For paramedical students only.) I. 3-4 hr. PR: Consent. Lectures and demonstrations on the gross and microscopic anatomy of the human body including development.
102. *Gross Anatomy.* (For physical therapy students.) II. 3 hr. PR: Anat. 101 and/or consent. Functional gross anatomy of the back, extremities, head, and neck.
103. *Microanatomy.* (For physical therapy students.) I. 2 hr. PR: Consent. Introductory cell and tissue structure for students in the Division of Physical Therapy.
109. *Oral Histology* (For dental hygiene students.) II. 3 hr. PR: Consent. Histological structure and embryological development of the teeth, tissues, and organs of the oral cavity.
152. *Introduction to Physical Anthropology.* II. 3 hr. PR: Consent. Man's physical heritage (human evolution) in principle and through paleontology, man's current physical nature (race and ecology), and biologic basis of man's culture. (Same as Sociology/Anthropology 152.)
301. *Gross Anatomy of the Trunk.* (For medical and a limited number of regular full-time graduate students in basic medical sciences, with consent of chairperson.) I. 5 hr. PR: Gross anatomical study of the back, thorax, abdomen, pelvis, and perineum.
302. *Gross Anatomy of the Head and Neck.* (For medical and a limited number of regular full-time graduate students in the basic medical sciences with consent of chairperson.) II. 3 hr. PR: Gross anatomical study of the head and neck.

304. *Gross Anatomy of the Extremities.* (For medical students and a limited number of regular full-time graduate students in basic medical sciences, with consent of chairperson.) II. 2 hr. PR: Gross anatomical study of the upper and lower extremities.
305. *Microanatomy.* (For medical students and a limited number of regular full-time graduate students in basic medical sciences with consent of chairperson.) I. 6 hr. PR: General biology or equiv. Cells, tissues, and organs.
306. *Gross Anatomy of the Trunk and Extremities.* (For dental and graduate students.) I. 4 hr. PR: General biology and consent. Gross anatomical study of the back, upper extremity, thorax, abdomen, and pelvis.
307. *Gross Anatomy of the Head and Neck and Neuroanatomy.* (For dental and graduate students.) II. 5 hr. PR: Anat. 306 or equiv. and consent. Gross anatomical study of the head and neck and a brief gross and microscopic anatomical study of the central nervous system.
308. *Neuroanatomy.* (For students in physical therapy and graduate students, and other health sciences.) II. 2 hr. PR: Consent. Gross and microscopic structure of the central nervous system. (See also Conjoined Course 375, Neurobiology.)
309. *Microanatomy and Organology.* (For dental and graduate students.) I. 4 hr. PR: General biology or equiv. and consent. Cells, tissues, and organs.
312. *Special Topics in Anatomy.* II. 2-4 hr. PR: Anat. 301 or 306; and 305 or 309; consent. Different topics of current interest in anatomy, not included in the regular graduate courses.
314. *Applied Anatomy.* II. 2-6 hr. per sem. PR: Consent. Detailed study of anatomy adapted to the needs of the individual student.
318. *Oral Histology and Embryology.* (For dental and graduate students.) II. 2 hr. PR: Anat. 305 or 309, and consent. Structure, function, and development of oral tissues and organs.
401. *Advanced Gross Anatomy.* I, II. 2-6 hr. per sem. PR: Anat. 301, 302, 304, or 306, 307, and consent. Morphological and functional analysis of a selected region. With dissection.
402. *Advanced Developmental Anatomy.* II. 2-4 hr. per sem. PR: Anat. 301, 302, 304 and/or consent. Detailed development anatomy of the fetal period and infancy. With dissections and analysis of variations and malformations. (Course not offered in 1978-79.)
403. *Seminar.* I, II. 1-6 hr. (1 hr. per sem.) Course may be repeated. PR: Consent. Special topics of current or historical interest.
405. *Experimental Embryology.* II. 3 hr. PR: Embryology and cellular physiology or biochemistry and consent. Development, differentiation, and regeneration.
406. *Advanced Neuroanatomy.* I. 2-4 hr. per sem. PR: Conjoined Course 375 and/or consent. Detailed study of selected areas of the nervous system. May be repeated.
408. *Histochemistry.* II. 3 hr. PR: Anat. 305 or 309, biochemistry, and consent. Histochemical theory and techniques.
451. *Advanced Microanatomy.* I, II, or S. 2-4 hr. PR: Anat. 305 or 309, or Biol. 263 and consent. An extension of the major topics included in Anat. 305 or 309. Special emphasis on recent contributions. (Course not offered in 1978-79.)
491. *Advanced Anatomy.* I, II. 2-8 hr. PR: Consent.
497. *Research.* I, II, S. 1-15 hr. PR: Consent. May be repeated as needed with consent of the Graduate Committee.

Biochemistry

The intent of this program is to prepare doctoral candidates to contribute in a significant fashion to the field of biochemistry; the program consists of a vigorous curriculum in the classroom and laboratory. During the first nine months the student achieves familiarity with the content of biochemistry by taking a comprehensive introductory course and two or more specialized courses in biochemistry. He or she will also take a major course outside the department; e.g., advanced organic chemistry or physical chemistry. During this same period the student will obtain an extensive introduction to the methodology of biochemistry by spending periods of four weeks each in the laboratories of four or five faculty members; during each period the student will carry out a project which is related to the research going on in that laboratory.

At the end of the first 9-12 months the student develops, with faculty advice, a doctoral thesis project which is pursued for the next $2\frac{1}{2}$ to 3 years; course work is still undertaken but the emphasis is shifted to research. Finally, the student prepares and presents the results of his or her work in the form of a dissertation. A period of four years is usually required to complete this curriculum.

A curriculum leading to an M.S. degree also is possible by special arrangement.

Admission Requirements

The entering graduate student should hold a bachelor's degree with a science major and should have successfully completed the following courses: Physics, Organic Chemistry, Calculus, Physical Chemistry, Qualitative Analysis, and Quantitative Analysis; a deficiency in certain of the above courses may, in some cases, be made up after admission to the program.

Application is made by having the following items sent to the Department: (a) the completed departmental application form (sent on request); (b) three letters of recommendation from professors who can evaluate the student's potential; (c) a transcript of the applicant's college grades; (d) the official Graduate Record Exam (GRE) scores. Usually students are admitted only once a year in mid-August. The deadline for the receipt in the Department of applications and supporting documents is June 1; to be considered for financial support, applications should be submitted much earlier, preferably by February 1. For more details write to: Graduate Coordinator, Department of Biochemistry, West Virginia University Medical Center, Morgantown, WV 26506.

Research and Instruction

Research Areas — Hormonal regulation of hepatic carbohydrate metabolism. Enzyme kinetics. Lipid metabolism and biogenesis of membranes. Structure and function of transfer RNA; RNA synthesis in mammalian cells. Atherosclerosis. Physical chemistry of proteins. tRNA methyltransferases in normal and tumor systems. Influence of nutrition on tissue protein and amino acid metabolism. Chemistry of host-parasite relationship. Interaction of macromolecules in biological systems. Physical biochemistry. Nutritional oncology. Immunochemistry.

Biochemistry

Biochem.

139. *Introduction to Biochemistry*. I. 4-5 hr. PR: Inorganic chemistry. (For pharmacy and medical technology students; others by consent.) A. Lecture and conference, 4 hr. B. Laboratory, 1 hr.
231. *General Biochemistry*. I. 7 hr. PR: Inorganic chemistry, organic chemistry. (For medical students and limited number of regular full-time graduate students in basic science departments with consent of Chairman of Biochemistry). Lecture, conference, and demonstration.
239. *Clinical Chemical Techniques*. II. 4 hr. PR: Biochem. 139, 231 or equiv. (Primarily for medical technology students; open to other qualified students by consent.)
305. *General Biochemistry*. II. 4 hr. PR: Inorganic chemistry, organic chemistry, and consent. (Dental and graduate students.) Lecture, conference, and demonstration.
399. *Special Topics*. I, II, S. 1-12 hr. PR: Consent.
491. *Advanced Study*. I, II. 3-4 hr. PR: Consent. Designed primarily to provide a background for students who use biochemistry in their research. Emphasis will be on basic principles and concepts useful for the solution of important biological problems. The principles and concepts will be presented in the manner in which they developed and grew out of laboratory experimentation in biochemistry.
496. *Graduate Seminar*. I, II. 1 hr. PR: Biochem. 231 or equiv., consent. Presentation and discussion of special topics.
497. *Research*. I, II, S. 1-15 hr.

Conjoined Basic Sciences Courses

In the curricula of the School of Medicine, certain courses are conducted on nondepartmental or interdepartmental lines. These have been designed as Conjoined Courses.

314. *Medical Human Growth and Development*. (For medical and limited number of graduate students.) II. 1 hr. PR: Consent. Basic considerations of embryology, organogenesis, teratology, and other factors influencing intrauterine growth and development and the adaptation of the fetus to extrauterine life.
320. *Electron Microscopy*. II. 2-4 hr. PR: Consent. Graduate students, upperclassmen in the sciences, medical students. Interdisciplinary. Introduction to cell fine structure and function. Preparation of biological specimens for electron microscopy.
322. *Biostatistics and Evaluation of Medical Literature*. (For medical and limited number of graduate students.) I. 2 hr. PR: Consent. Statistical analysis of biologic phenomenon as related to medicine.
350. *Radiation Safety and Isotope Usage*. II. 1-2 hr. PR: Physics 1 and 2, Chem. 15 and 16 or consent. Chemical, physical, and biological aspects of radiation; safety; handling and storage of radioactive materials; ERDA (formerly AEC) and WVU regulations and licensing; detection and instrumentation, research, and clinical use of radioisotopes.
370. *Medical Genetics*. (For medical and limited number of graduate students.) II. 1 hr. PR: Consent. Genetics and heritable diseases in man.
375. *Neurobiology*. (For medical and limited number of graduate students.) II. 6 hr. PR: Anat. 301 and Physiol. 345, or consent. Anatomy and physiology of the nervous system correlated with clinical neurology.

399. *Selective Experiences in Medicine*. Fourth year. I, II, S. CR. PR: Satisfactory completion of first three years of medical curriculum. (Graded as S or U.) The selective program for fourth-year medical students offers a wide range of opportunities, in the basic sciences, medical specialties and sub-specialties, and in family medicine. The year is composed of eleven 4-week blocks. Six must be spent at WVU Medical Center in Morgantown and approved programs at the Charleston Division, WVU Medical Center; Wheeling Division, School of Medicine; and Veterans Administration Hospital, Clarksburg. The remainder may be spent at community hospitals in West Virginia, or at university or university-affiliated hospitals out-of-state. Each student plans the individual program, with faculty advice. Flexibility is permitted. With consent of the instructors concerned, the student may, during the year, alter the selective choices. The student must give five weeks notice before changing an intramural or extramural selection. (See intramural and extramural folders, published annually, describing the selective opportunities.)

Microbiology

The Department of Microbiology offers programs of study leading to Master of Science and Doctor of Philosophy degrees in Medical Microbiology. Students are given extensive training in microbiological research methodology. The program aims towards training students capable of designing and carrying out their own research programs and teaching microbiology.

Admission Requirements

Applicants should have had at least four upper-level courses in the biological sciences, two semesters of organic chemistry, two semesters of physics, and a strong background in mathematics — including calculus — in order to be considered for admission. Applicants must submit to the Department of Microbiology a departmental application form, three letters of recommendation, and Graduate Record Examination (GRE) scores, both aptitude and advanced. In addition, transcripts and an official application for admission to the Graduate School must be sent directly to the WVU Office of Admissions and Records. Applicants for admission to a degree program should have a grade-point average of 3.0, or better, and a score of 600 or above on each of the GRE examinations. Early application is encouraged. An applicant desiring financial aid should complete the application before January 1.

Program Requirements

Every student must take a two-semester sequence in basic microbiology (Microbiol. 310 and 311) and two semesters in biochemistry. Seminar is a required course for all students each semester they are in residence. All students in the department also are required to participate in teaching at least one semester a year. The remaining courses are selected by the student and the advisory committee from courses in Microbiology, numbered 317 or higher, and from outside the department.

The department has informal noon-hour journal clubs scheduled four days a week, one each in cell biology, immunology, virology, and bacteriology and parasitology.

The Master of Science program requires 30 hours of course work, of which at least 20 must be in microbiology. Six hours must be in research. A research thesis and a final oral examination are required. A grade-point average of 3.0 must be achieved. In general, two years are needed to complete the M.S. program.

The Doctor of Philosophy program requires a dissertation representing the results of an original research investigation, and passing of qualifying and final oral examinations. Appropriate course work with a grade-point average of 3.0 also is required. Where appropriate, course work in related subjects, such as calculus, physical chemistry, and statistics, will be required. Three years are usually needed to complete the Ph.D. program.

For additional information, write to the Chairman, Department of Microbiology, WVU Medical Center, Morgantown, WV 26506.

Research and Instruction

Research Areas — Pathogenic bacteriology: Mode of action of microbial products in pathogenicity; identification and classification of anaerobic microorganisms including filamentous bacteria; oral microbiology; ecology of the oral cavity; clinical microbiology. Mycology: Pathobiology of medical mycoses; environmental health implications of fungal and algal toxicoses. Physiology: Nutrition and metabolism of a variety of pathogenic microorganisms. Genetics: Basic studies on the mechanisms of genetics including transfer of genetic information. Virology: Basic studies on varial-tumor relationships; virus-induced antigens in transformed cells; pathogenesis of lymphocytic choriomeningitis virus. Parasitology: Host-parasite relationships between helminth parasites and insects and vertebrate hosts. Electron Microscopy: Cytological studies of the fine structure of microorganisms and the influence of environment on these structures. Immunology: Studies on the mechanisms of antigen-antibody reactions and the development of hypersensitivity; immunopathology of pulmonary disease.

Microbiology

Microbiol.

- 26. *Microbiology*. I. 3-4 hr. (For students in paramedical sciences.) Pathogenic microorganisms.
- 220. *Microbiology*. II. 4 hr. (For pharmacy students.) PR or Conc.: Biochemistry. Pathogenic microorganisms, including immunology and antimicrobial agents.
- 223. *Microbiology*. II. 5 hr. (For medical technology students; graduate students with consent.) PR or Conc.: Organic chemistry. Basic microbiology. Emphasis on immunology, pathogenic microorganisms, and clinical laboratory techniques.
- 224. *Parasitology*. II. 4 hr. (For medical technology students.) Study of animal parasites and disease vectors with emphasis on disease manifestations, parasite biology, and laboratory diagnosis.
- 301. *Microbiology*. I. 5-7 hr. (For medical students.) PR: Organic chemistry, biochemistry. Detailed study of pathogenic microorganisms. Emphasis on use of microbiology in solving clinical problems.
- 302. *Microbiology*. I. 5 hr. (For dental students.) PR: Organic chemistry. Detailed study of pathogenic microorganisms. Emphasis on oral flora.
- 310. *Structure and Activities of Microorganisms*. I. 2-7 hr. PR or Conc.: Biochemistry; consent. Structure and activities of microorganisms: their structure, metabolism, nutrition, growth, and genetics. Life cycles of a few model systems. (Students may enroll for one to three parts of the course.)

311. *Principles of Infection and Resistance*. II. 1-5 hr. PR or Conc.: Biochemistry; consent. Introduction to the principles of innate and acquired resistance and to the mechanism of pathogenesis of medically important microorganisms. (Students may enroll for one to five parts of the course.).
317. *Special Problems in Microbiology*. I, II, S. 1-7 hr. per sem. with a total of 24 hr. available.
327. *Parasitology*. II. 4 hr. (For graduate students.) PR: Consent. Study of animal parasites and disease vectors with emphasis on disease manifestations, parasite biology, laboratory diagnosis, and current concepts in parasitological research.
490. *Teaching Practicum*. I and II. 1-3 hr. PR: Consent. Supervised practices in college teaching of microbiology. (Graded as S or U.)
491. *Advanced Study*.

Pathogenic Virology. I. 3 hr. PR: Microbiol. 310 and 311 or equiv., consent. Pathogenesis of medically important viruses and mechanisms for their control.

Pathogenic Bacteriology. I. 2-3 hr. PR: Microbiol. 311, consent. Pathogenic bacteriology, with an emphasis on the mechanisms of pathogenesis. Topics include microbial adherence, toxin production and mechanisms, and normal flora and disease.

Clinical Laboratory Bacteriology. II. 2-4 hr. PR: Microbiol. 311 or equiv., consent. Lectures on the identification of pathogenic microorganisms with an emphasis on bacteria. The laboratory includes a rotation through the hospital clinical microbiology laboratory. Limited enrollment. (Graded as S or U.)

Microbial Genetics. I. 4 hr. PR: Microbiol. 310 or equiv., consent. Molecular aspects of mutation, gene transfer mechanisms, genetic mapping, and genetic control using bacteria and bacteriophage systems as models. (Course not offered in 1978-79.)

Bacterial Physiology. II. 2 hr. PR: Microbiol. 310, biochemistry, consent. The physiology and metabolism of bacteria of medical, industrial, and ecological importance. (Course not offered in 1978-79.)

Immunobiology. 2 hr. PR: Microbiol. 311, consent. Discussion of biological and cellular aspects of immunology. Immunobiology, immunopathology, and cellular immunology receive strong emphasis. This course is designed to complement Biochem. 491. (Course not offered in 1978-79.)

Medical Mycology. I. 4 hr. PR: Microbiol. 311 or equiv. Advanced study of the fungi of medical importance, including the pathobiology of mycoses and toxicoses. (Course not offered in 1978-79.)

Comparative Cytology. II. 4 hr. PR: Consent. Limited enrollment. Basic features in structure and function of animal, plant, and microbial cells and their organelles. Projects in electron microscopy. (Course not offered in 1978-79.)

Advanced Cellular Biology. II. 1-3 hr. PR: Consent. Interdisciplinary team-taught course. Includes three modules: an overview of cell biology, cell surfaces, and somatic cell genetics. (Students may enroll for one, two, or three modules.)

Tumor Virology. II. 3 hr. PR: Biol. 315 or equiv., consent. A consideration of the molecular and biochemical aspects of viruses which cause tumors and the mechanisms by which they cause cellular transformation.

Clinical Laboratory Virology. S. 3 hr. per 6-week session. PR: Consent. Lectures and laboratories on isolation of viruses from clinical specimens. Includes serological methods.
496. *Seminar*. I, II. 1 hr. PR: Microbiol. 310 or equiv. (Graded as S or U.)
497. *Research*. I, II, S. 1-15 hr. PR: Microbiol. 310 or equiv. Students may enroll more than once. (Graded as S or U.)

Pathology

Research Areas — Atherosclerosis; thrombosis; platelet aggregation and function; lipid and lipoprotein metabolism in cultured human endothelial cells; morphometric (including electronmicroscopic) and biochemical studies on the progression of atherosclerotic lesions in humans; regression of experimental atherosclerotic lesions; ultrastructural aspects of renal disease; ultrastructural reflections of dedifferentiation in neoplasia; biomedical applications of laboratory medicine; applied laboratory studies in microbiology.

Pathology

Path.

128. *Introduction to General Pathology*. I. 2 hr. PR: Enrollment in Dental Hygiene or Physical Therapy. A study of the basic pathologic processes in man.
129. *Oral Pathology*. II. 3 hr. PR: Path. 128, Dental Hygiene major, or consent. Application of fundamental knowledge of general pathology to pathological conditions that occur in the oral cavity.
328. *General Pathology*. (For dental students.) I. 5 hr. PR: Anat. 309. General changes in basic pathologic processes and changes evoked in specific organ systems as a basis for understanding clinical disease.
338. *Oral Pathology I*. II. 3 hr. PR: Path. 328, consent. Application of knowledge gained in Path. 328 to the study of specific diseases affecting the oral cavity.
350. *Hematology*. 3 hr. PR: Consent.
352. *Laboratory Medicine*. (For medical students, second year.) II. 5 hr. PR: Consent. All topics relating to clinical pathology; hematology, fluid and electrolytes, chemical microscopy, serology, and blood banking.
353. *Oral Pathology II*. I. 2 hr. PR: Path. 338, consent. Continuation of Path. 338.
354. *General and Systemic Pathology*. Yr. 15 hr. PR: Consent. (For medical students, second year.) In-depth study of basic disease processes and changes affecting organ systems. Lectures, laboratories, problem-solving, case studies with clinico-pathologic correlation used as basis for understanding clinical disease.
355. *Clinico-Pathologic Correlation Conference*. (For dental students, third year.) II. 1 hr. PR: Consent; Path. 338, 353. Interesting clinical cases are demonstrated grossly, radiographically, and histologically. Diagnosis is established and treatment discussed.
356. *Advanced Pathology*. I, II. 3 hr. PR: Path. 328 and 354, and consent. Microscopic and gross specimens from selected autopsies.
382. *Advanced Oral Histopathology*. I, II. 1-2 hr. PR: Path. 338, 353, consent. Microscopic study of head and neck lesions.
401. *Special Studies in Oral Pathology*. I, II. 1-3 hr. PR: Consent. Advanced seminar or independent study of local and/or systemic disease processes affecting oral and facial structures.
401. *Advanced Oral Pathology*. I, II. 1-3 hr. PR: Consent. Advanced seminar and laboratory study of local and systemic disease processes affecting the oral structure.
497. *Research*. I, II. 1-15 hr. PR: Consent.

Pharmacology

Pharmacology is the medical science which involves all aspects of the action of drugs on living systems and their constituent parts. These range from the chemical reactions taking place within cells to the evaluation of a drug in the treatment of human disease. The Department of Pharmacology offers graduate studies leading to the degrees of Master of Science and Doctor of Philosophy with research concentrations in such areas as autonomic pharmacology, biochemical pharmacology, neuropharmacology, psychopharmacology, molecular pharmacology, pharmacogenetics, malarial chemotherapy, and toxicology.

Admission Requirements

Regular applicants for the graduate program in pharmacology should present, as a minimum, the following undergraduate courses: one semester of biology; two semesters of physics; one semester of calculus; five semesters of chemistry including two semesters of organic chemistry and one semester of physical chemistry. Reading knowledge of at least one foreign language is strongly recommended. Three letters of recommendation from science professors, an official transcript, and the results of the Graduate Record Examination — including the advanced test in either chemistry or biology — are also required. The prospective student should have a minimum 3.0 overall grade-point average at the undergraduate level.

In general, students requesting financial support should have all credentials forwarded by February 1. For additional information write to the Director of Graduate Studies, Department of Pharmacology, WVU Medical Center, Morgantown, WV 26506.

Master of Science

Ordinarily the department does not accept graduate students solely into a master's program. However, the master's degree is offered and is recommended as an intermediate degree en route to the Ph.D. Its primary function, as viewed by the faculty, is as an aid to the student new to research for the formulation, conduct, and writing of an abbreviated, but complete, independent research project. The course work requirements for the M.S. in pharmacology usually consist of Physiology 344 and 345, Biochemistry 231, Statistics 311, Pharmacology 361, 364, 461, 462, and 497. Some students may, with the faculty's concurrence, choose to proceed directly with their doctoral research without a master's degree. These students must submit a comprehensive progress report on their research to date before taking either the written or the oral Ph.D. qualifying examinations.

Doctor of Philosophy

Before official admission to candidacy for the doctorate, the student must satisfactorily complete both a written and an oral comprehensive qualifying examination. The written examination is generally taken during the sixth semester in the program (not counting summers) on or about March 1. The student will generally have some choice as to questions which must be answered. Two days (6 hours a day) are generally required to complete the written examination. When a student has successfully passed the written examination, a committee — ordinarily consisting of at least three members of the Department of Pharmacology and two

members from outside the department — is appointed and constitutes the oral examining body. The oral portion of the qualifying examination is held not less than two nor more than six weeks after the successful completion of the written examination.

Dissertation

Upon admission to candidacy for the Doctor of Philosophy degree, the candidate must select a topic for dissertation under the direction of the candidate's adviser, complete a dissertation which makes a contribution to knowledge in the candidate's area of concentration, and pass an oral examination based primarily upon the dissertation. After successful completion of the oral examination and submission of the final copy of the dissertation, the candidate will be recommended for the degree.

Research and Instruction

Research Areas — Autonomic pharmacology; autonomic regulation of the cardiovascular system and of smooth muscle; sensitivity to autonomic drugs; electrophysiologic studies of cardiac and smooth muscle; synthesis, storage, release and metabolism of transmitters and adrenal medullary hormones. Chemotherapy: Antimalarial agents, anticancer agents, effects of pharmacological agents on single cell organisms. Biochemical pharmacology: Drug metabolism, effects of drugs on lipid and nucleic acid metabolism. Endocrine pharmacology: Mechanism of action of steroids, metabolism of sex accessory tissues, relationship of hormones to tumor growth and development. Neuropharmacology: Biochemical basis of epilepsy, mechanism of action of anticonvulsant drugs, neuromediators in the central nervous system. Toxicology: Metabolism of toxic agents, pulmonary toxicology, environmental toxicology, perinatal pharmacology and toxicology. Electron microscopy: Effects of drugs on the ultrastructure of cells.

Pharmacology

Pharmacol.

160. *Pharmacology*. (For undergraduate students in the paramedical sciences.) II. 3 hr. Interactions of clinically useful therapeutic agents with the mammalian system.
242. *Pharmacodynamics and Therapeutics II*. I. 6 hr. (For pharmacy and graduate students.) PR: Pharmacy 240 or consent. Continuation of Pharmacy 240.
360. *Pharmacology*. I. 4 hr. (For dental and graduate students.) PR: Dental student standing or consent. Lecture and laboratory on pharmacologic actions and therapeutic uses of drugs.
361. *Pharmacology*. II. 6 hr. PR: Consent of department chairman. (For medical students and a limited number of regular, full-time graduate students in basic medical science departments.) Lecture-conference-laboratory on principles, pharmacodynamic actions, and therapeutic applications of clinically useful drugs.
363. *Toxicology*. II. 3 hr. PR: Consent. Offered in alternate years. Theoretical concepts and general principles of toxicology with special emphasis on biochemical and molecular mechanisms of chemical toxicity. (*Course not offered in 1978-79.*)
364. *Advanced Pharmacology*. I. 1-4 hr. PR: Pharmacol. 361 or consent. Offered every third year. Advanced lectures and discussion of general principles of pharmacology including physiochemical properties, absorption, distribution and metabolism of drugs, and drug receptor theory. (*Course not offered in 1978-79.*)

365. *Advanced Pharmacology*. I. 1-4 hr. PR: Pharmacol. 361 or consent. Offered every third year. Advanced lectures and discussion of specialized areas of pharmacology including biochemical, endocrine and cardiovascular pharmacology.
366. *Advanced Pharmacology (Laboratory in Drug Evaluation)*. S. 1-3 hr. PR: Consent. Laboratory procedures and demonstrations in assessing drug action. (*Course not offered in 1978-79.*)
367. *Advanced Neuroparmacology*. I. 1-4 hr. PR: Pharmacol. 361 or consent. Offered every third year. Advanced lectures on the actions of drugs on the central and peripheral nervous system. (*Course not offered in 1978-79.*)
461. *Seminar in Pharmacology*. I, II. 1 hr. per sem. PR: Pharmacol. 361 or graduate status in basic medical sciences.
462. *Literature Survey*. I, II. 1 hr. per sem. PR: Graduate status in pharmacology. Current literature pertinent to pharmacology including journals of allied biological sciences.
490. *Teaching Practicum*. I, II. 1-2 hr. per sem. PR: Pharmacol. 361 and consent. Critical evaluation of preparation and delivery of lectures in specified areas of pharmacology. For advanced graduate students.
491. *Advanced Study*. I, II, S. 1-6 hr. PR: Consent. Investigation in advanced subjects which are not covered in regularly scheduled courses. Study may be independent or through specially scheduled lectures.
497. *Research*. I, II, S. 1-15 hr. per sem.

Physiology and Biophysics

The objective of the Department of Physiology and Biophysics graduate program is to educate physiologists in the methods of conducting independent research of high quality, and of effective teaching. The department's graduates are conversant with all aspects of physiology and are prepared to interact creatively with scientists in related fields. To this end the program leading to the degree of Doctor of Philosophy emphasizes close interaction of faculty with students and a high faculty/student ratio. The Master of Science program includes 24 hours of course work and a research project leading to the thesis.

Admission Requirements

Individuals from a wide variety of backgrounds study Physiology and Biophysics as one of the basic medical sciences. It is, in fact, not uncommon to find physiologists with such diverse backgrounds as engineering, biology, chemistry, physics, psychology, and mathematics. The department encourages the participation of qualified individuals from many undergraduate and graduate disciplines. There are, however, certain prerequisite courses a student must take either before enrollment or during the first year in the program. These prerequisites, designed to give a student the proper foundation for advanced study in Physiology and Biophysics, are: Calculus (2 semesters, 3 desired), Physics (2 semesters, with calculus), Modern Biology (2 semesters), and Physical Chemistry (1 semester).

The department requires the following materials for consideration for the M.S. or Ph.D. program: Three letters of recommendation, transcripts of all undergraduate and graduate grades, and a completed departmental application form. Graduate Record Examination scores (aptitude and one advanced test) are useful, and are required for financial aid. A bachelor's degree or equivalent is

required for admission; an M.S. degree is not a prerequisite for the Ph.D. program.

A complete application kit and detailed descriptions of the degree programs can be obtained by writing to the Graduate Adviser, Department of Physiology and Biophysics, West Virginia University School of Medicine, Morgantown, WV 26506. Although applications may be submitted as late as June of the year of matriculation, applications must be received before February 1 to be considered for financial aid.

Doctor of Philosophy

The first year in the program normally includes the following courses: Medical Physiology (7 hours), Biochemistry (4 hours), Statistics (3 hours), Neurophysiology (3 hours) or Neurobiology (6 hours), Graduate Colloquium (2 hours), Physiological Methods (5 hours), electives, and prerequisites (a limited number of which may be made up during the first year). The first-year curriculum familiarizes the student with some of the same basic science material presented to the medical students. Medical physiology, biochemistry, and neurophysiology/neurobiology are part of the medical curriculum. The courses are team-taught by scientists specializing in each of the areas covered. In addition, the student is introduced to the full range of activities in the department through the Graduate Colloquium, and Physiological Methods provides a foundation in the research strategies, techniques, and tools used by physiologists and biophysicists.

During the first summer, students may begin research projects in departmental research laboratories of their choice. They also may take elective courses or make up prerequisites.

During the second year, the student combines course work with the continuing development of research interests. A graduate adviser is selected during this year. Courses normally include: Advanced Physiology (12 hours), Physiological Methods (2-4 hours), Graduate Colloquium (2 hours), Seminar (a total of 2 hours must be taken during the student's program), and Teaching Practicum (assisting in laboratory/demonstrations, conducting small-group conference sessions, giving lectures). Commonly chosen electives include gross anatomy, pharmacology, and advanced or specialized topics in biochemistry and biophysics. The second-year curriculum takes the student beyond the medical curriculum, emphasizing critical appraisal of the current research literature. Students begin to present discussions of research topics in the Graduate Colloquium and Seminar.

After completion of the second academic year, the student takes a qualifying examination consisting of three written research design papers followed by an oral examination dealing with these papers and with the course work of the preceding two years. Upon successful completion of the qualifying examination, the student is admitted to candidacy for the degree of Doctor of Philosophy in Physiology and Biophysics.

During the third and fourth years the student may enroll in elective courses. Yearly participation in the Teaching Practicum provides experience in delivering lectures to undergraduate and professional students. However, the student's major effort is directed toward dissertation research, with presentations about the research in the Graduate Colloquium. During these years the students will attend and present papers at national meetings of scientific societies (American Physiological Society, Biophysical Society, Endocrine Society, Federation of American Societies for Experimental Biology, Society for Neurosciences.)

The Ph.D. program is generally completed in four years.

Master of Science

Prerequisites for admission to the master's program are the same as those for the doctoral program. The first academic year and first summer are likewise identical for the master's and doctoral students. During the second year of the master's program, the student enrolls for 4 hours of Advanced Physiology, Graduate Colloquium, and sufficient electives to fulfill the required 24 hours of course work. In addition, 6 hours of research are directed toward completion of the Thesis. The M.S. program is typically completed in two years.

Research and Instruction

Research Areas — Cellular, membrane transport and electrical properties of excitable tissue; integrative and behavioral functions of the nervous system; regulation and dynamics of the circulation, respiration, endocrine, and electrolyte balance systems; theoretical and experimental biophysics; and biomedical instrumentation.

Physiology

Physiol.

141. *Elementary Physiology.* (For undergraduate students in paramedical sciences.) II. 4 hr. PR: College biology and chemistry, or consent. Systematic presentation of basic concepts. 3 lect., 1 lab.
241. *Mechanisms of Body Function.* I. 4 hr. PR: College chemistry, biology, physics, and algebra or graduate status and approval. A systematic examination of the homeostatic functions of the human body with emphasis on the physicochemical mechanisms involved. Pathophysiology and clinical correlations are introduced in relation to normal physiology.
248. *Experimental Design.* (For advanced undergraduate and selected graduate students.) II. 3 hr. PR: Consent. Theory and practical experience in design of experiments and processing of physiological data using small laboratory digital computers. 1 lect., 2 lab.
343. *Fundamentals of Physiology.* (For dental students and a limited number of regular full-time graduate students in medical center basic science departments.) I. 5 hr. PR: College physics, algebra, chemistry, and consent of department chairman. Analysis of basic facts and concepts relating to cellular processes, organ systems and their control. 3 lect., 1 conf., 1 lab.
344. *Medical Physiology.* (For medical and a limited number of regular full-time graduate students in medical center basic science departments.) I. 3 hr. PR: College physics, algebra, chemistry, and consent of department chairman. Analysis of basic facts and concepts relating to cellular processes, organ systems, and their control, with clinical correlations. 1 lect., 1 conf.-lab.
345. *Medical Physiology II.* (For medical and a limited number of regular full-time graduate students in medical center basic science departments.) II. 4 hr. PR: Physiol. 344 and consent of department chairman. Continuation of Physiol. 344. 3 lect., 1 conf.-lab.
346. *Neurophysiology.* (For medical and a limited number of regular full-time graduate students in medical center basic science departments.) II. 3 hr. PR: College algebra, physics, and consent of department chairman. Properties of excitable tissues (nerve and muscle), synaptic transmission, reflexes and central nervous system function, and behavior. 2 lect., 1 conf.

347. *Biophysical Analysis*. II. 4 hr. (Alternate Years.) PR: Math. 17 and Physiol. 345 or consent. Systems biophysics, method of analysis, and their application in the quantitative study of biological phenomena. 3 lect., 1 conf.-seminar.
399. *Special Topics*. I, II, S. 1-4 hr. PR: Consent. Assigned study designed to develop research skills.
441. *Physiological Methods I*. II. 1-5 hr. PR: Variable for four modules: None for modules 1 and 2; calculus and physiology, or consent, for modules 3 and 4. Research techniques and strategies for physiology and biophysics, presented in four modules: animal surgery, computer methods, physiological instrumentation, and compartmental analysis. Enrollment in various combinations of modules for variable credit possible.
442. *Physiological Methods II*. I. 1-4 hr. PR: Variable for four modules: Calculus and physiology, or consent for modules 1, 2; module 3 of 441 or consent, for modules 3 and 4. Advanced research techniques and strategies in physiology and biophysics, in four modules: Subcellular physiological methods, principles of modeling, electrophysiology, and monitoring physiological parameters.
444. *Graduate Seminar*. I, II. 2 hr. PR: Graduate status and consent. (Graded as S or U.)
447. *Systems Biophysics*. II. 4 hr. (Alternate Years.) PR: Physiol. 347 or consent. Quantitative analysis of physiological regulatory systems. 2 lect., 2 conf.-seminar.
490. *Teaching Practicum*. I, II. 1-3 hr. PR: Consent. Supervised practices in college teaching of physiology. (Graded as S or U.)
491. *Advanced Physiology*. I, II, S. 1-15 hr. PR: Consent. Lecture-conference in: cellular physiology and biophysics, neurophysiology, circulation, respiration, acid-base and renal physiology, digestion and energy metabolism, and endocrinology. 3 lect., 3 conf.
497. *Research in Physiology and Biophysics*. I, II, S. 1-15 hr.
498. *Thesis*. I, II, S. 2-4 hr. PR: Consent. (Graded as S or U.)
499. *Graduate Colloquium*. I, II. 1-6 hr. PR: Consent. (Graded as S or U.)

Medical Technology

The WVU Medical Technology graduate program prepares graduate medical technologists for positions either as administrators and teachers in medical technology educational programs, or as supervisors in special areas of the clinical laboratory. The primary objective is to assist in development of knowledge in an area in administration, in education, or a special area of interest selected by the student which may be a special medical laboratory science as the specific area applies to laboratory medicine. Specializations include clinical chemistry, clinical microbiology, hematology, and immunohematology. The specific course work requirements for the master of science degree rests with the graduate adviser in the student's specific area of interest.

Graduate Committee: Professors J. Krall, B. Love, H. Mengoli, D. Moore, Jr., N. Rodman, and T. Sodeman.

(Information concerning the Medical Technology undergraduate program may be found in the *WVU Medical Center Catalog*.)

Admission

Applicants must have a baccalaureate degree in medical technology from an accredited institution or a baccalaureate degree in an applied field and be a certified medical technologist with the American Society of Clinical Pathologists.

The area of concentration in medical technology desired by the student is considered in the evaluation of the undergraduate record as follows:

1. Individuals who desire to do special study in clinical chemistry, hematology, or immunohematology must have completed 8 hours of physics, 3 hours of mathematics, 4 hours of organic chemistry, and 4 hours of quantitative chemistry on the college level.

2. Individuals who desire to do special study in microbiology must have completed 4 hours of organic chemistry and 16 hours of biological sciences.

3. A minimum of one year's experience in a clinical laboratory is required for admission.

Students will be required to make up deficiencies in the above as well as other deficiencies deemed necessary by the adviser.

Applicants must have a minimum undergraduate grade-point average of 2.5 (based on A = 4.0 grade points) for admission.

Two letters of reference must be on file in the Medical Technology office. One letter should be from the major adviser in the undergraduate college and another from the immediate supervisor of the applicant's present position. An interview may be requested.

Applicants are selected for admission on the basis of scholastic standing, recommendations, and interest in the field of medical technology. The number of applicants accepted is necessarily limited by the available facilities; and in general, applicants with the most experience are considered first.

Application Procedure

A preliminary application is filed in the Medical Technology office.

Letters of recommendation are sent to the Medical Technology office from two individuals who are familiar with the applicant's ambitions, abilities, and qualifications.

After approval of the preliminary application, the admission procedure is the same as for other programs of the WVU Graduate School.

A personal interview may be required before final admission to the program.

Course of Study

It is expected that the students who enter the graduate program in Medical Technology will have a goal in mind and a special field of interest in medical technology. The program is tailored to the needs of the student as far as possible. A minimum of 36 semester hours of credit including a research problem is required. The student selects a major area of concentration from either education, supervision, or administration, and a minor area from clinical microbiology, clinical chemistry, clinical hematology, or immunohematology.

A minimum of 12 semester hours of course work in education to include the following is required of all students:

(a). The three following courses are required:

Ed. Psych. 330 — Advanced Educational Measurements.....	3 hr.
Ed. Psych. 320 — Introduction to Research.....	3 hr.
Ed. Found. 320 — Philosophic Systems and Education	3 hr.

(B). The student selects *one* of the following:

Health Ed. 305 — Philosophy of Health Education	3 hr.
Ed. Psych. 361 — Instructional Systems	3 hr.
Ed. Psych. 450 — Psychological Foundations of Learning	3 hr.
Ed. Psych. 451 — Principles of Instruction	3 hr.
Ed. Adm. 330 — Principles of Education Leadership.....	3 hr.
Ed. Found. 300 — Sociology of Education	3 hr.

(C). Ed. Psych. 311 or Stat. 311 (Statistical Methods) is strongly recommended.

Other courses to complete 36 semester hours are selected by the student (with the help of the adviser) in the area of concentration selected by the student. Students may select courses in departments in schools other than the School of Medicine.

All students must complete a minimum of 18 semester hours in a science related to medical technology including Seminar (3 hr.) and Problem Study (6 hr.).

All students must rotate for orientation purposes through all sections of the University Hospital Clinical Laboratories to include microbiology, hematology, chemistry, immunohematology, and histopathology for a minimum of two days in each laboratory or a total of ten days.

In addition, at the discretion of the student's adviser, other requirements in teaching, supervision, and administration may be necessary.

The adviser works out with the student a plan of study for the entire graduate program. This plan is usually made at the end of the first semester of the student's graduate study. A copy of this "plan of study" is signed by the adviser and student and sent to the Medical Technology office to be put in the student's file.

Examinations

A final written comprehensive examination in the major and minor interest areas is given approximately one month before the date on which the degree is to be awarded.

An oral defense of the problem is given about one month after submission of the Problem Study in its final form to the Graduate Committee.

Requirements for Degree

All requirements for the master of science degree, as outlined in the *WVU Graduate School Catalog*, must be fulfilled. These requirements can be fulfilled in three semesters of full-time work, but ordinarily at least four semesters are required for completion of the degree requirements.

Degree candidates must have a 3.0 grade-point average and must have removed all incomplete grades and deficiencies.

All students must complete a problem study (see M.T. 497).

Medical Technology

M.T.

300. *Seminar*. I, II, S. 1 hr. Student registers for 1 hr. each semester. Seminars include laboratory management, education in medical technology, and timely topics. Minimum of 3 hours of seminars to include all three topics is required.

491. *Advanced Study*. I, II, S. 1-6 hr. PR: Consent. Investigation in advanced subjects which are not covered in regularly scheduled courses. Study may be independent or through specially scheduled lectures.
497. *Research*. I, II, S. 1-15 hr. Student is required to pursue study on a problem in the student's area of concentration. This study is reported in a thesis-style manuscript. For this study and report, the student registers in M.T. 497. Total number of hours earned in M.T. 497 is determined by the student's adviser. As many as 9 semester hours may be taken during one semester or, by arrangement with the adviser, credit hours may be taken over several semesters. In the final compilation for degree requirements, only 6 semester hours in M.T. 497 will be counted toward fulfillment of the 36 required semester hours for the degree even though the student may have registered for as many as 15 hours in M.T. 497.

Mineral and Energy Resources

The College of Mineral and Energy Resources (COMER) offers graduate curricula leading to the Master of Science degree in four fields: mining engineering, mineral processing engineering, mineral resource economics, and petroleum engineering. A Ph.D. degree in Mineral Engineering can also be earned utilizing the multidisciplinary engineering Ph.D. under the control of the Graduate School. A student desiring to take courses for graduate credit in the College of Mineral and Energy Resources must first apply for admission to the Graduate School and state the major field.

For information concerning applications and requirements for the interdisciplinary Ph.D. program, see the interdisciplinary Ph.D. program under College of Engineering.

An applicant with a baccalaureate degree or its equivalent in the major field corresponding to the graduate study desired will be admitted on the same basis as graduates of WVU. Lacking these qualifications, the applicant must first fulfill the College of Mineral and Energy Resources requirements in the field in which the student is seeking an advanced degree.

Academic Standards. Each student will, with the approval of the student's graduate committee — appointed by the consent of the student within the first semester of registration — follow a planned program. The program contains a minimum of 24 hours of course work and 6 hours of independent and original study in the minerals field leading to a master's thesis. At least 60 percent (18 hours) of the course credits must be from 300-level or 400-level courses while the remainder can be made up of 200-level courses.

Approval for candidacy for a graduate degree by faculty action is required to establish eligibility for a degree. A graduate student may request approval by formal application after completing a minimum of 12 semester hours of graduate courses with a grade-point average of at least 3.0 (B), based on all graduate courses in residence for which final grades have been recorded.

No credits are acceptable toward an advanced degree which are reported with a grade lower than C. To qualify for an advanced degree, a graduate student must have a grade-point average of at least 3.0 based on all courses completed in residence for graduate credit. Each candidate for a degree must select a major subject and submit a thesis showing independent, original study in the minerals field.

General Minerals Program

M.

200. *Elements of Mineral Conservation*. I. 3 hr. PR: Junior standing. Open to any WVU student. Economics of conservation for nonrenewable resources; traditional and modern views; new environmentalist concerns. Current and forecast demand and supply conditions for mineral and energy resources including coal, water, oil, gas, ores, and industrial minerals; causes of mineral loss and environmental costs in production and utilization; methods of environmental control and conservation in underground and surface mining. 3 hr. lec.
207. *Earthquake Seismology*. II. 3 hr. PR: Physics 11. Earthquakes, their causes and area distribution; theory of elastic waves; principles of seismograph construction, adjustment and operation; interpretation and calculation of seismograms with exercises provided by records of the University seismography station. 3 hr. lec.
230. *Elements of Geophysical Prospecting*. I. 3 or 4 hr. PR: Geol. 1, Physics 11. Locating subsurface oil, gas, and mineral deposits. Field investigation using instruments with 4 hr. section.
234. *Applied Geophysics*. II. 3 hr. PR: Physics 12 and Geol. 151 or consent. Origin of the universe and the planets, heat and age of the earth. Application of the science of geophysics in the location and analysis of earthquakes and in prospecting for oil and minerals.
250. *Evaluation of Capital and Operating Costs in the Mineral Industries*. I, II. 3 hr. Estimating capital and operating costs of mineral industries. Evaluation of potential investments, comparisons of investment alternatives, estimation of profitability, and payout of new ventures. Special problems of investment decisions in mining, petroleum, and other facets of the mineral industries. 3 hr. lec.
301. *Topics in Resource Science*. S. 3 hr. PR: Chem. 141, Geol. 151, C.S. 261. Relationship between entropy and geologic anomalies, mineral occurrence models, resource conservation, and entropic balances. 3 hr. lec.

Engineering of Mines

E.M.

201. *Fire Control Engineering*. II. 3-4 hr. PR: Senior standing in an engineering curriculum or consent. Aspects involved in the control from fire, explosion, and other related hazards. Protective considerations in building design and construction. Fire and explosive protection organization including fire detection and control. Lectures (3) and/or 3 hr. lab.
212. *Advanced Mining*. I, II. 3 hr. PR: E.M. 108: PR or Conc.: E.E. 105. Engineering principles, methods, and equipment applied to mine transportation, hoisting, and drainage. 3 hr. lec.
213. *Mine Ventilation*. I, II. 3 hr. PR: E.M. 108, M.E.M. 42, C.E. 115. Engineering principles, purposes, methods, and equipment applied to the ventilation of mines. 2 hr. lec., 3 hr. lab.
215. *Industrial Safety Engineering*. II. 3 hr. PR: Junior standing or consent. Problems of industrial safety and accident prevention, laws pertaining to industrial safety and health, compensation plans and laws, and industrial property protection. 2 hr. lec.
216. *Mine Safety Engineering*. I. 3 hr. PR: E.M. 108 and E.M. 215. Analysis and application of mining health and safety laws to the work processes of the mining industry.
219. *Advanced Mining Methods for Vein Deposits*. II. 3 hr. PR: E.M. 108. Methods and systems of mining other than flat seams. Emphasis on selection of methods in relation

to cohesive strength of ore bodies and their enclosing wall rocks. Mining of anthracite included. 3 hr. lec.

220. *Mine Design*. I, II, S. 3 hr. PR: E.M. 212, 213, 241, and senior standing. Comprehensive design problem involving underground mining developments or surface plant or both, as elected by the student in consultation with instructor. Preparation of a complete report on the problem required, including drawings, specifications, and cost analysis. 9 hr. lab.
221. *Mine Design*. II. 2 hr. PR: E.M. 212, 213, 241. Design principles and methods pertaining to mine water treatment, refuse disposal and treatment, dust control systems, reclamation and revegetation. 6 hr. lab.
222. *Mine Equipment and Machinery*. I. 3 hr. PR: E.E. 105, E.M. 212. Selection, installation, operation, and maintenance of mining equipment. 3 hr. lec.
223. *Mine Management*. II. 3 hr. PR: Math. 18, E.M. 108, 212, and senior standing. Economic, governmental, social, and cost and labor aspects of mining as related to the management of a mining enterprise. 3 hr. lec.
224. *Mining Engineering Problems*. I, II. 1-6 hr. PR: Senior or graduate standing or consent. Special problems in mining engineering, including choices among operations research, mine systems analysis, coal and mineral preparation, and coal science and technology.
228. *Mine Equipment and Machinery Controls*. I. 3 hr. PR: E.M. 222 or consent. Principles, application, and use of electric and hydraulic devices and circuits for protection and control of mine machinery and equipment. 3 hr. lec.
229. *Advanced Mining Equipment Applications*. II. 3 hr. PR: E.M. 228. Structural, mechanical, hydraulic, and electrical characteristics of the more common items of mining equipment. Controls, electrical and hydraulic circuits, and mechanical transmissions with associated problems. Laboratory design of a control system for a mining machine. 2 hr. lec., 3 hr. lab.
241. *Mechanics of Ground Control in Mines*. I and II. 3 hr. PR: M.E.M. 42 or consent. Rock properties and behavior, *in situ* stress field, mine layout and geological effects: designs of entry and pillar and roof bolting, convergence of openings and surface subsidence engineering. 1 hr. lab.
247. *Explosives Engineering*. I. 3 hr. PR: Chem. 16, M.E.M. 43. Theory and application of explosives, composition properties and characteristics of explosives, blasting design fundamentals, legal and safety considerations. 3 hr. lec.
249. *Rock Mechanics*. II. 3 hr. PR: M.E.M. 43 or consent. Elastic and plastic properties of rock, Mohr's criteria of failure, elastic theory, stress distribution around underground openings, open pit and underground stability rock testing techniques. 2 hr. lec., 1 hr. lab.
290. *Surface Mining*. II. 3 hr. PR: E.M. 108, Geol. 151, M.E.M. 43, or consent. Open pit mining, quarrying, and stripping, with emphasis on planning, production, and equipment systems. 3 hr. lec.
- 301, 302. *Advanced Mine Design*. I, II. Credit arranged. Advanced detail design and layout of coal mine plant, particularly incorporating new ideas of machines and mining methods.
307. *Explosive Engineering Design*. II. 3 hr. PR: E.M. 247 or consent. Rock drilling, total blast systems simulation, experimental studies in blast design, rock fracturing, chemical thermodynamics, kinetics, and reaction rates. 3 hr. lec.
311. *Advanced Ground Control—Coal Mines*. I. 3 hr. PR: E.M. 241 or consent. Ground and strata control for underground and surface coal mining, including slope stability and subsidence.

316. *Advanced Rock Mechanics*. II. 3 hr. PR: E.M. 249 or consent. Testing techniques and interpretation, strength and fracture, classification, anisotropy, friction, jointed rock, fluid pressure, fragmentation, and excavation.
351. *Coal Mining*. S. 3 hr. PR: Chemistry, 10 hr.; physics, 8 hr.; and accompanied or preceded by general geology. Especially for students who are planning to teach mining subjects in high school. Not open to students taking E.M. 108 or 212.
365. *Advanced Deterministic Methods for Mineral Engineers*. I. 3 hr. Analysis and solution of mineral engineering problems which require use of deterministic models. Application of deterministic methods to mineral transportation, mineral resource allocation and extraction problems, and mine planning and equipment utilization problems. 3 hr. lec.
366. *Advanced Stochastic Methods for Mineral Engineers*. II. 3 hr. Application of stochastic methods to mineral engineering problems in equipment selection, renewal processes, mine ventilation, mine production, and mineral extraction. 3 hr. lec.
- 395, 396. *Graduate Seminar in Coal Mine Operation and Administration*. I, II. 3-6 hr. PR: B.S. degree and consent of committee. Problems related to production, preparation, marketing, and utilization of coal, with special assignments and emphasis in accordance with personal background and field of interest of student.
497. *Research*. I, II. 1-15 hr.

Petroleum Engineering

Pet.E.

207. *Natural Gas Engineering*. I. 4 hr. PR: Pet.E. 211, C.E. 115. Principles of natural gas production, transmission, distribution, processing, regulation, measurement, storage, and analysis with a laboratory devoted to principles of equipment utilized in the operations. 3 hr. lec., 3 hr. lab.
210. *Drilling Engineering*. I. 3 hr. PR or Conc.: Geol. 1, Math. 18, C.E. 115. Rock properties, well-bore hydraulics, air and gas drilling factors affecting penetration rate, slim-hole, lifting capacity liquid, air, or gas, two-phase flow, casing and casing string design, well-bore primary and squeeze cementing, vertical and directional drilling, minimum cost drilling. 3 hr. lec.
211. *Production Engineering*. II. 3 hr. PR: Pet.E. 210. Well completion, performance of productive formation, drill stem tests, completion of wells, flowing wells, gas lift methods and equipment, pumping installation design, well stimulation, emulsion, treating, gathering and storage of oil and gas, field automation. 3 hr. lec.
212. *Drilling Fluids Laboratory*. I. 1 hr. PR or Conc.: Pet.E. 210, Chem. 141, C.E. 115. Drilling fluids control relative to pilot testing, drilling fluid design procedures and measurement of composition and properties. 3 hr. lab. and discussion.
216. *Petroleum Engineering Design*. II. 3 hr. PR: Pet.E. 234. Comprehensive problem in design involving systems in oil and gas production, field processing, transportation, and storage. Three 3-hr. labs.
224. *Petroleum Engineering Problems*. I, II. 1-6 hr. PR: Graduate or senior standing. Investigation and detailed report on a special problem in petroleum or natural gas engineering. Supervised by a member of the faculty.
233. *Elements of Petroleum Reservoir Engineering*. II. 3 hr. PR: Pet.E. 236. Basic properties of petroleum reservoir rocks. Fluid flow through porous materials. Evaluation of oil and gas reserves. 3 hr. lec.
234. *Applied Petroleum Reservoir Engineering*. I. 3 hr. PR: Pet.E. 233. Application of reservoir engineering data to calculation of recovery potentials and to analysis,

simulation, and prediction of reservoir performance under a variety of production methods to effect maximum conservation. 3 hr. lec.

235. *Formation Evaluation*. II. 3 hr. PR: Math. 17, Pet.E. 210 or consent. Various well logging methods and related calculations with exercises in interpretation of data from actual well logs. 2 hr. lec., 3 hr. lab.
236. *Mechanics of Hydrocarbon Fluids*. I. 3 hr. PR or Conc.: Chem. 141. Qualitative and quantitative phase behavior of single and multicomponent hydrocarbon systems with emphasis on application to petroleum production engineering and petroleum reservoir engineering. 2 hr. lec., 3 hr. lab.
241. *Oil and Gas Property Evaluation*. II. 3 hr. PR: Pet.E. 211, 234, 235. Petroleum property evaluation. Calculation of reserves and future reservoir performance, decline curves, production and formation testing, pressure transient analysis, reservoir test limit, analysis of data, curve fitting, evaluation of processing facilities, and analysis of profitability. 3 hr. lec.
244. *Petroleum Reservoir Engineering Laboratory*. II. 1 hr. PR or Conc.: Pet.E. 233. Laboratory evaluation of basic and special petroleum reservoir rock properties. 3 hr. lab.
300. *Hydrocarbon Production From Carbonate Rocks*. I. 3 hr. PR: Pet.E. 233, 235. Theory on the production of oil and gas from carbonate rocks, definition and classification of pore geometry, fluid flow characteristics, performance of carbonate rock reservoirs and stimulation of these reservoirs. 3 hr. lec.
301. *Advanced Petroleum and Natural Gas Engineering Design*. I, II. Credit arranged. PR: Graduate or senior standing. Advanced detail design problems in some phase of petroleum and natural gas exploration, production, and transportation, particularly incorporating new ideas, machines, and methods.
302. *Fluid Flow in Porous Media*. I. 3 hr. PR: Pet.E. 234, Math. 18 or consent. Theoretical and practical aspects of the physical principles of hydrodynamics in porous media. 3 hr. lec.
340. *Secondary Recovery of Oil by Water Flooding*. II. 3 hr. PR: Pet.E. 233. Theory of immiscible fluid displacement mechanism, evaluation and economics of water flood projects, and oil field flooding techniques. 3 hr. lec.
342. *Well Stimulation by Hydraulic Fracturing*. I. 3 hr. PR: Pet.E. 210, 233. Hydraulic fracturing fluids. Parameters involved in fracturing. Fracture initiation, orientation, and extension. Productivity increase after fracturing. Propping agents and general fracturing treatment design. Optimization of fracturing cost. 3 hr. lec.
343. *Advanced Secondary Recovery*. I. 3 hr. PR: Pet.E. 340. Secondary recovery of oil by gas flooding, miscible fluid injection, *in situ* combustion, and heat injection. 3 hr. lec.
351. *Thermodynamics of Reservoir Fluids*. I, II. 3 hr. PR: Pet.E. 207, 236. Thermodynamic properties of single and multiphase hydrocarbon fluids. Processing natural gas and petroleum crudes and fluid dynamics of processed fluids. 3 hr. lec.
362. *Reservoir Simulation and Modeling*. II. 3 hr. PR: Pet.E. 233, I.E. 281, or consent. Finite difference equations and their applications for fluid flow equations in porous media, types of grids, explicit and implicit schemes, material balance equation for oil and gas reservoirs, solution of single-phase, two-phase and three-phase flow in one, two, and three dimensions, simulation of depletion drive reservoirs, gas reservoirs, and other simulation methods. 3 hr. lec.
394. *Special Topics*. I, II. 1-6 hr. PR: Consent. Selected fields of study in petroleum and natural gas engineering.
497. *Research*. I, II. 1-15 hr.

Mineral Processing Engineering

M.P.E.

203. *Theory of Coal Processing*. I. 3 hr. PR: Chem. 16. Origin, petrography, and classification of coals discussed and correlated to the technological properties of coal which, in turn, are related to processibility. 2 hr. lec., 3 hr. lab.
209. *Mineral Preparation*. II. 3 hr. PR: M.E.M. 42, C.E. 115, or consent. Preparation, beneficiation, and concentration of metallic and nonmetallic ores for further processing or utilization. 2 hr. lec., 3 hr. lab.
212. *Coal Processing*. I. 3 hr. PR: Chem. 141 or M.P.E. 103. Coal processing technologies from the perspective of coal mining industry: pyrolysis, liquefaction, and gasification. 3 hr. lec.
217. *Coal Preparation*. I, II. 3 hr. PR: Consent. Formation of coal, rank classification of coal, coal petrography, principles of preparing and beneficiating coal for market with laboratory devoted to sampling, screen analysis, float and sink separation, and use of various types of coal cleaning equipment. 2 hr. lec., 3 hr. lab.
218. *Advanced Mineral Preparation*. I. 3 hr. PR: E.M. 209 or 217. Theory and practice of concentration of ores and industrial minerals with special consideration to more recent advances in beneficiation of ores and coal. 2 hr. lec., 3 hr. lab.
224. *Mineral Problems*. I, II. 1 to 9 hr. PR: Senior or graduate standing or consent. Special problems considered in minerals beneficiation and processing, including choices among design and research projects in coal preparation, coal conversion, (process) hydro- and extractive metallurgy or minerals economy.
233. *Theory and Practice of Coal Preparation*. S, I. 3 hr. PR: Consent. Physical and chemical theory of coal preparation technology with emphasis on the application of modern coal cleaning equipment. This course is designed for high school teachers seeking background in the field of coal processing. 2 hr. lec., 3 hr. lab.
250. *Control Systems in Mineral Processing*. II. 3 hr. PR: Junior standing in mineral processing engineering. The instrumentation and automatic control systems used in today's mineral processing technology are studied not only to cover data recording and control but also to learn process optimization. 3 hr. lec.
270. *Design and Synthesis*. I, II. 3 hr. PR: Consent. The logic and quantitative tools required for synthesizing mineral processing systems are brought to bear on a realistic problem by students working independently. Specific attention on economic and environmental implications. 1 hr. lec., 6 hr. lab.
271. *Design and Synthesis*. I, II. 3 hr. PR: M.P.E. 270. Continuation of M.P.E. 270. 1 hr. lec., 6 hr. lab.

Mineral Resources Program

M.E.R.

210. *The Economics of the Mineral Industries*. II. 3 hr. Analyzes for the nonfuels resource availabilities, market structure, characteristics, and long-run demands. Regional impacts are considered as these relate to national mineral policies and environmental controls. 3 hr. lec.
222. *Energy Economics*. I. 3 hr. Analyzes energy sector of the economy, inter-fuel competition, current and future markets, and international trade. New energy technologies. 3 hr. lec.
300. *Minerals Technology Forecasting*. I, II. 3 hr. PR: Consent. Introduction and review of techniques used for forecasting minerals technology. Detailed basic principles. Intended for users and evaluators of these techniques.

301. *Minerals Technology Assessment*. I, II. 3 hr. PR: Consent. Introduce and review those methods applied to the systematic study of the effects on society that may occur when a mineral technology is introduced, extended, or modified.
305. *Transportation of Solids and Fluids*. I. 3 hr. Study is made of the complex systems required for transportation of solids and minerals. Designed for economy and minimal adverse environmental effects. 3 hr. lec.
310. *Hydrometallurgy I*. I. 3 hr. PR: M.P.E. 181. Introduction to hydrometallurgy, covering the principles of hydrometallurgy and their applications. Structure of H_2O , theory of leaching, and practical leaching systems. 3 hr. lec.
311. *Hydrometallurgy II*. II. 3 hr. PR: M.E.R. 310. Continuation of M.E.R. 310. Includes studying a detailed review of principles of hydrometallurgy and a study of the unit operations in hydrometallurgy. Application of solvent extraction. 3 hr. lec.
320. *Design of Minerals Beneficiation Operations I*. II. 4 hr. PR: Consent. Advanced design of mineral processing systems is performed by the mature student using his extensive technical background on a realistic mineral processing problem. 1 hr. lec., 9 hr. lab.
321. *Design of Minerals Beneficiation Operations II*. II. 4 hr. PR: M.E.R. 320. Continuation of M.E.R. 320. 1 hr. lec., 9 hr. lab.
324. *Advanced Special Topics*. I and II. 1-6 hr. PR: Consent. Special advanced problems in mineral process engineering including choices among topics related to coal preparation, conversion, and process metallurgy.
332. *Substitute Liquid Fuel Processes*. I. 3 hr. PR: Graduate or senior standing or consent. Heat and mass transfer and systematic methods of materials and energy balances. Energy conversion processes for coal gasification, retorting tar sands, oil shales, and underground storage of natural gas. Substitute liquid fuel manufacturing processes from gaseous fuels, direct liquefaction of coal, and some unconventional sources. 3 hr. lec.
350. *Readings in Mineral Resource and Energy Economics*. I, II. 3 hr. Review of current mineral economic studies. Selected authors in mineral science and engineering, the economics of natural resource exploitation and environmental control, national mineral policy, world mineral development and trade. 1 hr. lec. and independent study.
351. *Mineral Resource Appraisal and Exploration Decisions*. II. 3 hr. Introduces appraisal techniques for mineral resources including spatial models of occurrence and geostatistical models. Relation of changes in infrastructure and market demands to the value of regional resources. 3 hr. lec.
381. *Theory and Policy of Mineral Economics*. II. 3 hr. Defines the pure theory of resources and energy allocation with technologic, geologic, and environmental constraints. A general model is presented with partial and special applications for major problem areas: resource valuation, conservation, exhaustion, taxation, and trade. Problems of imperfect competition and monopoly open consideration to the foundations of policy in practice and theory. 3 hr. lec.
392. *The Economics of the Energy and Petrochemical Sectors*. I. 3 hr. PR: Consent. Energy and petrochemical complexes are defined within an open activity analysis model. The problems explored include forecasting energy demands joint production and costing, environmental controls, and impacts on regional and international trade. 3 hr. lec.
394. *Special Topics in Mineral Economics*. I, II. 6 hr. PR: Consent. Selected economic problems in petroleum and natural gas engineering and the mineral industries. 3 hr. lec.

398. *Models of Mineral Commodity Markets and Industries*. II. 3 hr. Econometric studies analyzing the behavior and problems of selected mineral industries and commodities from the viewpoint of the firm, industry, and region of interest. Applications include programming techniques. 3 hr. lec.
440. *The Economics of the Coal Industry*. I. 3 hr. Economic analysis of coal markets under current and proposed technological and environmental constraints. Applications include conversion products and production techniques.
495. *Graduate Seminar*. I, II. 1-4 hr. PR: Consent.
497. *Graduate Research*. I, II. 1-4 hr. PR: Consent.

Nursing

Master of Science in Nursing

The School of Nursing offers a program leading to a degree of Master of Science in Nursing (M.S.N.). This four-semester sequence program focuses on primary care for the preparation of the primary nurse clinician who is a generalist capable of adapting the nursing practice to whatever setting, age, or health condition the client's situation dictates. The role of a self-directed primary nurse clinician includes: (1) assessing the health status and health needs of individuals, groups, and communities in order to provide and evaluate quality nursing care; (2) participating as an agent in the decision-making process influencing the present and future health care systems; (3) analyzing research findings and applying these to the improvement of nursing practice; (4) identifying the emerging theories in nursing; and (5) asserting independence for personal development.

The degree requires a minimum of 41 hours of graduate courses. A core of nursing and cognates, culminating in a final semester clinical practicum and a master's thesis or paper, is required of all students.

Degree requirements must be completed within a five-year period. This period begins at the initial enrollment for graduate credits. Candidates who are unable to meet this requirement must submit, in writing, a petition to the graduate faculty of the School of Nursing subject to the approval of the Dean of the Graduate School.

Admission Requirements

The applicant must meet the admission requirements of the Graduate School of West Virginia University.

The applicant must have completed a baccalaureate program in nursing which is accredited by the National League for Nursing. Applicants from unaccredited baccalaureate nursing programs will be considered on an individual basis.

Elementary Statistics is a prerequisite.

The following are required of each applicant.

- a. Personal interview.
- b. Evidence of a current professional nursing licensure in at least one state.
- c. Nursing liability insurance.
- d. A letter of recommendation from each of the following: head of undergraduate nursing school, employer, and a colleague.
- e. Statement of professional goals.

Preference is given to an applicant with:

- a. An undergraduate grade-point average of B (3.0) or better (A = 4.0).
- b. At least one year of professional experience.

Admission Procedure

Application for admission to the Graduate School must be made on a standard form obtainable from the Office of Admissions and Records, West Virginia University, Morgantown, WV 26506. Application is to be returned to that office. (An applicant must be approved for a graduate program in order to be admitted to the Graduate School.)

A supplementary form will be sent to the applicant to be returned to the Chairperson, Graduate Level, School of Nursing, West Virginia University, Morgantown, WV 26506.

The Office of Admissions and Records will notify the applicant of the actions taken.

Degree Requirements

Completion of 41 semester credit hours.

Achievement of an overall academic average of B (3.0) or better (A = 4.0) in all work attempted in graduate school.

A master's thesis or a master's paper is required of all candidates.

Credit hours for courses in which the grade is lower than C will not count toward satisfying graduate degree requirements.

Removal of all conditions, deficiencies, and incomplete grades is necessary.

Students are expected to register for courses with letter grades (A, B, C) with the exception of electives which the student may opt to take with Satisfactory (S) or Unsatisfactory (U) grades subject to the approval of the adviser.

Curriculum Plan for a Master of Science in Nursing Degree (A Minimum of 41 Semester Hours)

All students will be expected to take the following courses:

A. Clinical Nursing (24 semester hours)	<i>Hr.</i>
Nsg. 300 — Primary Care Nursing	3
Nsg. 301 — Nursing Intervention: A Social Process	3
Nsg. 302 — Nursing and the Health Care System	3
Nsg. 310 — Health Assessment in Primary Care Nursing	3
Nsg. 311 — Primary Care Nursing Practice	3
Nsg. 312 — Nursing Role Reconsidered	3
Nsg. 400 — Clinical Practicum	3
Nsg. 491 — Advanced Study	3-6
B. Nursing Research (4 semester hours)	
Nsg. 370 — Theories in Nursing	2
Nsg. 373 — Nursing Research: Process and Methods	2
C. Cognates (10 semester hours)	
Physiology Course	4
Sociology Course	3
Educational Psychology Course	3
D. Elective	3

Typical Four-Semester Program

<i>First Sem.</i>	<i>Hr.</i>	<i>Third Sem.</i>	<i>Hr.</i>
Nursing 300.....	3	Nursing 302.....	3
Nursing 310.....	3	Nursing 312.....	3
Nursing 370.....	2	Ed. Psych. Course.....	3
Physiology Course.....	4		
	<hr/> 12		<hr/> 9
 <i>Second Sem.</i>	 <i>Hr.</i>	 <i>Fourth Sem.</i>	 <i>Hr.</i>
Nursing 301.....	3	Nursing 400.....	3
Nursing 311.....	3	Nursing 491.....	3
Nursing 373.....	2	Elective.....	3
Sociology Course.....	3		
	<hr/> 11		<hr/> 9

Nursing

Nsg.

300. *Primary Care Nursing.* I, II. 3 hr. Concepts from the behavioral, biological, and medical sciences are identified, analyzed, and synthesized for application appropriate to nursing intervention in complex health situations. Focus is primarily on health assessment of individual and family. (Taught conjointly with Nsg. 310.)
301. *Nursing Intervention: A Social Process.* II, S. 3 hr. PR: Nsg. 300 and 310. An in-depth exploration of concepts from behavioral sciences basic to an understanding of ways individuals and families cope with their specific health situation. Includes examination of nurse-client-health team interactions for development of helping relationships. (Taught conjointly with Nsg. 311.)
302. *Nursing and the Health Care System.* I, II. 3 hr. PR: Nsg. 301 and 311. Focus is on theory and techniques for change in health care delivery systems in today's society. Deficiencies in health care delivery services identified in nursing practice (Nsg. 310, 311) analyzed; alternatives for correcting these deficiencies are examined. Emphasis on relevance of change theory. (Taught conjointly with Nsg. 312.)
310. *Health Assessment in Primary Care Nursing.* I, II. 3 hr. PR: Physiology or consent. Practicum for the systematic application of primary care nursing concepts. Experiences provide for development of skills in assessing the health status of individuals and families in complex health situations. Development of skills in physical assessment is included. (Taught conjointly with Nsg. 300.)
311. *Primary Care Nursing Practice.* II, S. 3 hr. PR: Nsg. 300 and 310. Development of skills in assisting the infirm and ill during diagnostic and therapeutic programs; managing medical care regimens for acutely and chronically ill within established protocol; assessing community resources and facilitating families' efforts to utilize them. (Taught conjointly with Nsg. 301.)
312. *Nursing Role Reconsidered.* I, II. 3 hr. PR: Nsg. 301 and 311. Experiences in application of theories, examined in Nsg. 302, in selected practice settings. Emphasis on utilization of planned changes directed toward correction of recognized deficiencies in existing services to meet health needs of people (Taught conjointly with Nsg. 302.)
370. *Theories in Nursing.* I, II. 2 hr. Comparative analysis of emerging and evolving theories in nursing. Emphasis on the sources of nursing theory and the research suggested for testing current nursing theories.

373. *Nursing Research: Process and Methods*. I, II, S. 2 hr. An examination of the research process and methods as a basis of evaluating studies in nursing. Each student is expected to develop a research design for a topic the student has identified.
400. *Clinical Practicum*. II, S. 3 hr. PR: Nsg. 302, 312, and 373. Selected clinical experiences in which student has the opportunity to experience the role of a family nurse clinician in primary care nursing. A Master's paper is required if Nsg. 497 is not elected.
489. *Administration Practicum*. II, S. 3 hr. PR: Nsg. 302, 312, and 373. Experiences in which the student functions in the role of administrator in a selected health care delivery system. A Master's paper is required if Nsg. 497 is not elected. A supporting course with 3 credit hours is required. (*Course will not be offered in 1978-79.*)
490. *Teaching Practicum*. II, S. 3 hr. PR: Nsg. 302, 312, and 373. Selected teaching experiences in which student has the opportunity to function in the role of a teacher of primary care nursing. A Master's paper is required if Nsg. 497 is not elected. A supporting course with 3 credit hours is required. (*Course will not be offered in 1978-79.*)
491. *Advanced Study*. I, II, S. 1-6 hr. PR: Graduate standing, written consent. Selected topics from these areas: clinical nursing, nursing education, administration of health care delivery systems, and current issues in health care delivery services. (May be repeated for credit.)
497. *Research*. II, S. 1-15 hr. PR: Nsg. 302, 312, and 373, and Advanced Statistics (Inferential). Student completes a Master's thesis from the problem identified and developed in Nsg. 373.

Orthodontics Graduate Program

The School of Dentistry offers advanced education programs. The Department of Orthodontics offers a program of advanced study leading to the Master of Science degree. Programs leading to the Master of Science and Doctor of Philosophy degrees are available in the basic sciences of Anatomy, Microbiology, Biochemistry, Physiology and Biophysics, and Pharmacology. The Department of Oral Surgery offers one oral surgery internship and two oral surgery residencies. Three general practice residencies are offered by the School of Dentistry. Continuing education courses are offered throughout the year. Detailed information concerning admission requirements, courses of study, etc., in the intern and residency programs may be obtained from the Office of the Associate Dean for Advanced Education Programs.

Master of Science

The School of Dentistry and its Department of Orthodontics offer a program of advanced study and clinical training leading to the Master of Science degree. The program requires a minimum of 24 months (two academic years and two summers) of full-time residency in the School of Dentistry, and is designed to qualify dentists for careers in orthodontic clinical practice, teaching, and research.

Inquiries concerning this program should be directed to the Office of the Associate Dean for Advanced Education Programs. Applicants will be recommended to the Graduate School for admission. Those applicants approved for admission to the program will be notified soon after January 15.

Requirements for Admission to Orthodontics Program

1. Graduation from an accredited dental school.
2. Evidence of scholastic and clinical achievement that would indicate the applicant's ability to progress in a program of this nature.
3. Each applicant must file with the department all information requested in the department application form.

Requirements for Master of Science Degree for Students Enrolled in Orthodontics Program of School of Dentistry

1. Fulfillment of requirements of the Graduate School.
2. Twenty-four months (two academic years and two summers) of consecutive residency at the School of Dentistry.
3. An approved master's thesis based on original research completed during the period of residency in an area related to orthodontics.
4. Must satisfactorily pass a final oral examination.
5. Must complete a minimum of 56 credit hours. These include 35 hours of orthodontics courses, a minimum of 9 hours of selected basic science subjects, and a minimum of 6 hours of elective allied subjects, and a thesis (6 hours).
6. Must have demonstrated satisfactory clinical competence in the student's field.
7. Must have maintained a grade level commensurate with graduate education.

Orthodontics

416. *Biomechanics*. I, II, S. 2 hr. PR: Consent. Design and function of the teeth and their surrounding structures, and response of these tissues to orthodontic procedures.
417. *Orthodontic Technique*. I, II, S. 2 hr. PR: Consent. Laboratory course in techniques related to fabrication and manipulation of orthodontic appliances.
418. *Orthodontic Materials*. I, II, S. 1 hr. PR: Consent. Physical properties of materials used in orthodontic appliances.
419. *Orthodontic Diagnosis*. I, II, S. 1-3 hr. PR: Consent. Seminar-type class on technique of patient examination, acquiring diagnostic records, and analyzing and correlating this information to the treatment of clinical problems.
420. *Cephalometrics*. I, II, S. 1-3 hr. PR: Consent. Use of radiographic cephalometry in studying growth of the human face, analysis of dentofacial malformations, and evaluation of orthodontic treatment.
421. *Orthodontic Mechanics*. I, II, S. 1-4 hr. PR: Dent. 416, 417. Seminar and laboratory course on basic orthodontic mechanical properties.
422. *Advanced Orthodontic Mechanics*. I, II, S. 1 hr. PR: Dent. 421. Continuation of Dent. 421 involving more difficult type cases and introducing more sophisticated appliance therapy.
423. *Growth and Development*. I, II, S. 1-5 hr. PR: Consent. Seminar-type course on normal and abnormal growth of the human head and its application to orthodontics.
425. *Orthodontic Seminar*. I, II, S. 1-8 hr. PR: Consent. Discussions involving all branches of dental science, with special emphasis on the orthodontic interest. Assigned topics and articles in the literature discussed.

426. *Orthodontic Clinic*. I, II, S. 1-12 hr. PR: Dent. 416, 417. Clinical treatment of selected patients.
497. *Research*. I, II, S. 1-15 hr.

Pharmacy

Pharmaceutical Sciences

The School of Pharmacy offers programs of graduate study leading to the degree of Master of Science in the pharmaceutical sciences. Students may specialize in pharmaceutics, pharmacy administration, pharmacognosy, pharmaceutical chemistry (organic medicinal or pharmaceutical analytical), pharmacy, or pharmacology.

(Information concerning the School of Pharmacy's bachelor's program is available in the *WVU Medical Center Catalog*.)

Admission

Applicants for admission to the program must satisfy the general requirements for admission to the WVU Graduate School. Beyond this, the applicant should possess a B.S. degree with a minimum overall average of 2.75. In exceptional cases, a student with course deficiencies or with a grade-point average below 2.75 may be admitted as a special graduate student. The record of the student will be reviewed at the end of 12 hours, and the student may be allowed to pursue a degree program upon removal of any deficiencies and/or demonstration of ability to perform satisfactorily in the graduate program.

Academic Standards

No credits are acceptable toward a graduate degree which are reported with a grade lower than a C.

The graduate student must have a cumulative grade-point average of at least 3.0 in all graduate courses to qualify for the degree.

Requirements for Completion of Degree

Upon acceptance to the program, the student will select the student's major adviser who will also serve as chairman of the student's advisory committee and of the student's examination committee, and as thesis supervisor. The advisory committee will approve a plan of study and a research project for the thesis requirement.

To be eligible for the degree, the student must complete a minimum of 30 hours of graduate credit, of which no more than 6 hours may be for research and thesis.

Upon completion of the course work and research requirements, and after submission of the thesis, an oral examination will be administered by the appointed examination committee.

Further information may be obtained by writing to: Dean, School of Pharmacy, West Virginia University, Morgantown, WV 26506.

Pharmacy

Pharmacy Administration

- 232. *Social Aspects of Pharmacy*. 3 hr. Psycho-social aspects of pharmacists and patients in health care setting. Behavioral science factors which affect whether, why, or how medications and pharmaceutical services are used; role of pharmacists in health care.
- 320. *Drug Regulation and Control*. 3 hr. Legislation affecting the development, introduction, control, and utilization of drugs in the American economy.
- 321. *Drug Distribution Systems*. 3 hr. Detailed study and analysis of drug distribution in institutional environments.
- 323. *Economics of the Pharmaceutical Industry*. 3 hr. History, background, and formation of major drug industries. Oligopolistic practices, mergers, combines, costs of research, and production.

Pharmacognosy

- 340. *Organic Plant Constituents*. 3 hr. Occurrence, properties, biogenesis, etc. of a number of classes of organic compounds derived from plants. Emphasis on secondary metabolites which contain products of pharmaceutical or medicinal interest. (Course not offered in 1978-79.)
- 341. *Isolation of Plant Constituents*. 3-5 hr. Acquaints the student with techniques used in extraction, separation, and isolation of plant constituents. (Course not offered in 1978-79.)

Pharmaceutical Chemistry

- 272. *Medicinal Chemistry*. 3 hr. PR: Consent.
- 276. *Pharmaceutical Quality Control*. 3 hr. PR: Second-year standing in Pharmacy. Basic scientific principles in quality control of drugs and dosage forms, with particular attention to newer analytical techniques.
- 370. *The Synthesis of Drugs*. 4-5 hr. Design of drug molecules on the basis of structure-activity relationships and approaches to synthesis of such compounds. Laboratory to accompany in which representative types of biologically active compounds are prepared. (Course not offered in 1978-79.)
- 375. *Advanced Pharmaceutical Analysis*. 3 hr. Spectroscopic methods of analysis with emphasis on their applications in pharmaceutical problems and in biological sciences.
- 376. *Advanced Pharmaceutical Analysis*. 3 hr. Continuation of Phar. 375, with emphasis on electro-analytical methods and preparation of samples from pharmaceutical dosage forms and from biological materials.
- 377. *Advanced Pharmaceutical Analysis*. 3 hr. Physical-chemical principles involved in methods development. A special problem is assigned as an integral part of the course. (Course not offered in 1978-79.)

Pharmacy

- 211. *Sterile Products*. 3 hr. PR: Third-year standing in Pharmacy. Broad view of the technology involved in sterilization, and in the preparation and administration of sterile dosage forms. 2 hr. lec., 3 hr. lab.
- 300. *Industrial Pharmacy*. 4 hr. PR: Phar. 204 or graduate standing. Introduction of the manufacture of dosage forms of their quality control. Structure of the industry and governmental influences. Special attention to new drug evaluation with regard to safety and efficacy.

314. *Cosmetic Formulation*. 3 hr. PR: Phar. 203. Introduction to principles and basic considerations of cosmetic formulations, including review of anatomy/physiology of skin. Laboratory exposes students to practical aspects of processing the more popular cosmetic products.
- 215/315. *Physical Pharmacy*. 3 hr. PR: First-year standing in Pharmacy. Designed to illustrate the special application of physicochemical properties of materials to pharmaceutical and physiological systems. Especially useful in delineating formulation considerations impinging upon the stability of complex systems.
241. *Fundamentals of Pathophysiology*. 3 hr. PR: Anatomy and physiology or consent. Student is introduced to various disease states with emphasis on the pathophysiology underlying those diseases amenable to drug therapy.
243. *Chemotherapeutic and Immunobiologic Agents*. 3 hr. PR: Consent or second-year standing in Pharmacy. Bacterial, viral, and parasitic infections; immunobiological methods of prevention, modifications, and treatment; chemotherapeutic agents used in treatment; therapeutics and management.
256. *Therapeutics*. I. 3 hr. Clinical pharmacological approach to the study of currently used drugs in the proper management of disease.
301. *Advanced Biopharmaceutics*. 3 hr. Concepts of biopharmaceutics and pharmacokinetics in relation to the design and evaluation of dosage forms and determination of rational dosage regimens in health and disease.
302. *Advanced Pharmaceutics*. 3 hr. Physiochemical and biopharmaceutical principles involved in disperse systems (liquid, semi-solid, and solid) which function as dosage forms. Considerations of properties of solid dispersions, micromeritics, diffusion of liquid dispersions, interfacial phenomena, emulsification, suspensions, prolonged action medication, etc.
390. *Special Topics*. 1-4 hr.
391. *Seminar in Pharmaceutical Sciences*. 1 hr. Presentation and discussion of special topics and research in the pharmaceutical sciences.
396. *Special Problems in Pharmaceutical Sciences*. 1-3 hr. Where special interest is shown by the student in an area other than of the student's thesis research, a faculty member will supervise individual study and research.
491. *Advanced Study*. 1-6 hr. PR: Consent. Investigation in advanced subjects which are not covered in regularly scheduled courses. Study may be independent or through specially scheduled lectures. (*Course not offered in 1978-79.*)
496. *Graduate Seminar*. 1 hr. PR: Consent. It is anticipated that each graduate student will present at least one seminar to the assembled faculty and graduate student body of his program. (*Course not offered in 1978-79.*)
497. *Research*. 1-15 hr.
498. *Thesis*. 2-4 hr. PR: Consent.

Physical Education

Graduate students in the School of Physical Education pursue courses and scholarly tasks which may lead to the following degrees: (1) Doctor of Education with concentration in Physical Education or Safety Studies; or, (2) Certificate of Advanced Study with concentration in School Physical Education, Sport Studies, or Safety Studies.

Doctor of Education

Areas of faculty competencies and student interest areas for the Doctor of Education degree include: (a) motor learning, motor development, sport management, sport physiology, sport psychology, and sport sociology, and (b) accident countermeasures, driver safety, emergency preparedness, and safety management.

Admission Procedures

Individuals who wish to pursue a program leading to the Doctor of Education degree must be admitted to the WVU Graduate School. Applicants for admission must submit: (1) scores on the Aptitude Test of the Graduate Record Examination; (2) three letters of recommendation (one of which must be submitted by the applicant's immediate employment supervisor); and (3) a complete transcript of undergraduate and graduate education up to time of application. The applicant must comply with the general regulations of the Graduate School. Whenever practical a personal interview with the members of the Graduate Studies Advisory Committee of the School of Physical Education is recommended. All materials and procedures must be completed by March 1.

Acceptance as an advanced graduate student is contingent upon the Graduate Studies Advisory Committee's decision regarding the applicant's potential for scholarly productivity as judged by the Graduate Record Examination scores, past performance in course work, letters of recommendation, and personal interview. Applicants who satisfy the minimal standards for admission will be assigned a temporary adviser and will assume the status of an advanced graduate student.

Admission to the Program Procedures

Within the semester the advanced graduate student is completing the ninth hour of resident course work the student shall request, through the Office of the Chairperson of the Graduate Studies Advisory Committee of the School of Physical Education, admission to the program. This request may be made at any time during regular sessions of the University.

Advanced graduate students cannot register for course work beyond the ninth hour without having been admitted to the program.

Following the request of the advanced graduate student the Graduate Studies Advisory Committee will convene and decide upon admittance to or rejection from the program. The student need not be present at this meeting. In complex cases where a decision is difficult the student will be summoned to appear before the committee for further deliberation.

Program Requirements

Once the student is admitted to the program the student, in concert with the adviser, will select an advisory committee consisting of graduate faculty. It will be this committee's responsibility to aid the student in planning the total program. During the process of completing a program a student is expected to fulfill a residency requirement specified by the committee.

Admission to Candidacy Requirements

As the student nears the termination of the course work, application may be made to complete the final comprehensive examination. This examination shall consist of scholarly tasks designed to function as a comprehensive learning experience. The examination will be constructed by the student's advisory committee. The student shall be allowed to complete this examination one time and if unsuccessful may be permitted to recomplete the examination one more time upon an appeal and subsequent sanction of the student's advisory committee. There must be a time period of at least six months between the first and second examination periods.

Upon successful completion of the final comprehensive examination the student may then present to the advisory committee a prospectus of the dissertation. If the opinion of the committee is such that the student may proceed with the dissertation the student is admitted to candidacy.

Final Requirements

Upon the completion of the dissertation the candidate will appear before the advisory committee for purposes of orally defending the study. Successful defense of the dissertation results in the awarding of the degree.

Time Limitation

All requirements must be completed within seven years immediately preceding the awarding of the degree.

Certificate of Advanced Study Program

The program is designed to prepare school and other personnel who wish professional education beyond the master's degree. Candidates for this Certificate may choose either Physical Education or Safety Studies. Applicants for admission must submit: (1) scores on the Aptitude Test of the Graduate Record Examination; (2) three letters of recommendation (one of which must be submitted by the applicant's immediate employment supervisor); (3) a complete transcript of undergraduate and graduate education up to time of application; and (4) otherwise comply with the general regulations of the Graduate School.

Entrance Requirements

Applicants who have received bachelor's and master's degrees from an accredited institution are eligible for admission to the Certificate of Advanced Study program. Applications may be obtained from the WVU Office of Admissions and Records. Students will be admitted on the basis of undergraduate and graduate transcripts of earned course credit. Upon admission to WVU the student is automatically admitted to the program. If a person applies for consideration as a candidate for the Certificate of Advanced Study, and at some future date wishes to change the degree objective, it will be necessary to reapply to participate in the revised program.

Program Requirements

Upon admission the student, in concert with the major adviser, will select an advisory committee consisting of two additional members of the graduate faculty. This committee will aid the student in the construction of his or her program.

The program shall consist of a minimum of 30 course hours; 6 of these hours must be earned by successful completion of the Certificate of Advanced Study final scholarly project. This research requirement may be conducted apart from the physical limits of WVU but must be done under direction and supervision of the chairperson of the student's graduate committee.

Final Requirements

Upon completion of course work and the final scholarly project the student will orally defend the project before the advisory committee.

The candidate shall submit two bound and approved copies of the research problem to the Dean of the Graduate School. The format and binding procedures for the research problem are governed by Graduate School regulations.

Time Limitation

All requirements must be completed within five calendar years immediately preceding the awarding of the Certificate of Advanced Study.

Master of Science — School Physical Education or Sport Studies

The School of Physical Education offers courses leading to the Master of Science degree, with an emphasis in School Physical Education or Sport Studies.

Students are admitted as regular graduate students for work leading to the Master of Science degree in the School of Physical Education, provided they hold a baccalaureate degree from an approved institution of higher education; have a 2.75 undergraduate grade-point average; and satisfy prerequisites in the courses for which they register.

Students who do not meet the 2.75 grade-point average requirement but exceed a grade-point average of 2.5 may be admitted as a Regular Graduate Student with deficiencies and will be required to earn a 3.0 average in the first 9 hours of residence work in order to continue major interest area. (Courses taken in off-campus education are accepted for degree purposes provided the student has had prior approval from the student's adviser.) In order to receive the degree the student must have a minimum 3.0 average in all course work leading toward the degree and satisfy all Graduate School requirements.

Thirty-six semester hours are required for the Master of Science degree, distributed as follows:

- I. Satisfactory completion of the disciplinary core courses for the Master of Science degree. These are: P.E. 320, 340, 360, 365, and 380.
- II. In addition to the basic disciplinary core the student may elect to pursue either the curriculum devoted to School Physical Education or Sport Studies:

- a. *School Physical Education*
 1. 15 semester hours of basic Physical Education core.
 2. 6 semester hours of professional Physical Education courses: P.E. 305 and 445.
 3. 3 semester hours of research methodology: P.E. 315
 4. 6 hours of electives plus 6 hours of thesis
or
 5. 9 semester hours elected in approved courses and successful completion of a position paper (33 hours plus position paper; 3 hours of workshop credit may be applied to the total 33 hours)
or
 - 42 hours of course work.
- b. *Sport Studies*
 1. 15 semester hours of basic Physical Education core.
 2. 6 semester hours in research and statistics: P.E. 315 and 446.
 3. 9 semester hours elected from approved courses.
 4. 6 semester hours of thesis.

Master of Science — Environmental and Occupational Health Studies Option

An option under the M.S. degree program in Physical Education permits students to take advantage of University-wide expertise in Environmental and Occupational Health Studies. This option is designed for students who wish to pursue a career in health-related fields. Program emphasis areas are in Environmental or Occupational Health Studies.

Students are admitted as regular graduate students for work leading to the Master of Science degree in Environmental or Occupational Health, provided they hold a baccalaureate degree from an approved institution of higher education in the areas of biology, chemistry, engineering, physics, or other areas approved by the committee, have a 2.50 undergraduate grade-point average, and satisfy prerequisites in the courses for which they register. In order to receive the degree the student must have a minimum 3.0 grade-point average in all course work leading to the degree and satisfy all Graduate School requirements.

Admission to candidacy for an M.S. degree is required before obtaining that degree. A graduate student may apply for admission to candidacy by formal application after completing a minimum of 12 semester hours of graduate courses within the program with a grade-point average of at least 3.0 based on all graduate courses taken in residence, for which the student has received a grade at the time of application. Admission must be gained before completion of 18 semester hours.

A minimum of 36 semester hours is required for the Master of Science degree in Environmental and Occupational Health Studies.

Final Degree Requirements

A student may elect to culminate his or her program by submitting a thesis within the area of the student's major interest as regulated by the Graduate School (30 hours plus thesis) or 33 hours plus a 3-hour Environmental Health problem, or by passing a comprehensive examination conducted by a committee of at least three members of the faculties involved in the Environmental and Occupational Health Studies program.

Required Program

C.E. 251—(3 hr.)—Public Health Engineering
C.E. 345—(3 hr.)—Properties of Air Pollutants
Env. H. 320—(3 hr.)—Foundations of Environmental Health Practice
Env. H. 321—(3 hr.)—Epidemiology and Environmental Health Practices
I.E. 480—(3 hr.)—Environmental and Public Health Legislation
Env. H. 380—(6 hr.)—Internship: Environmental Health (*or Equivalent*)
Stat. 311—(3 hr.)—Biostatistics and Health Related Research

Electives

Ag. E. 341—(3 hr.)—Physical Climatology
Bact. 201—(4 hr.)—Environmental Microbiology
Bact. 348—(3 hr.)—Sanitary Bacteriology
CBSc. 350—(2 hr.)—Radiation Safety and Isotope Usage
C.E. 349—(3 hr.)—Solid Waste Disposal*
C.E. 350—(3 hr.)—Sanitary Chemistry and Biology*
Ch.E. 290—(3 hr.)—Introduction to Nuclear Engineering
Env. H. 325—(3 hr.)—Environmental Health Analysis*
Env. H. 326—(3 hr.)—Environmental Health Sampling*
H. Ed. 306—(3 hr.)—Community Health
I.E. 359—(3 hr.)—Operations Research for Public Health Administrators
I.E. 360—(3 hr.)—Advanced Human Factors Problems**
M.E. 282—(3 hr.)—Engineering Acoustics**
M.E. 264—(3 hr.)—Heating, Ventilation, and Air Conditioning**
Pharm. 363—(3 hr.)—Toxicology**
P.E. 491—(3 hr.)—Advanced Study in Work Physiology and Biomechanics
Saf. S. 330—(3 hr.)—Health Hazard Loss Control Management
Saf. S. 333—(3 hr.)—Disaster Preparedness and Emergency Systems

*Environmental Health Track

**Occupational Health Track

Master of Science — Safety Studies

Concentration in Safety Studies at the master's degree level provides opportunity for individuals to elect courses and related experiences aimed at developing competencies needed by driver safety educators, occupational safety managers, or school safety coordinators. Baccalaureate degree programs from which students are usually admitted include business management, engineering, technology education, physical education, physical science, psychology, sociology and anthropology, or safety, provided that a 2.5 grade-point average has been achieved. Otherwise, admission must be of provisional status which requires the student to earn a 3.0 average on the first 12 semester hours of residence work and also pass qualifying examinations in order to continue.

Regulations of the Graduate School govern the general requirements of the master of science degree. Additionally, however, the candidate must complete a minimum of 36 semester credit hours including an approved research experience in safety to qualify as a degree recipient. A grade-point average of 3.0 will be required for graduation.

Course work must be planned in consultation with the adviser and approval must be obtained from the adviser before enrollment in courses. Six semester hours of course work may be devoted to directed electives from one of the student's undergraduate major or minor fields or from a field allied to safety. Students are encouraged to complete the Aptitude Test of the Graduate Record Examination within the first 18 semester hours after matriculation. By this same time, students will be expected to have completed the following core of courses: Saf. S. 300, 310, 311, and 418 or equiv.

A student is accepted as an advanced candidate for the degree providing course work and requirements previously mentioned are of a satisfactory nature as judged by the graduate committee of the department. During the final term or semester of study, each student will be required to pass successfully an examination dealing with the core subject matter and specialization emphasis.

Special Advanced Graduate Students

Provision is made within the School of Physical Education which would permit an individual to apply for admission as a special advanced graduate student. The individual who wishes to pursue this must indicate this intention on the application form provided by the WVU Office of Admissions and Records. If a special advanced graduate student wishes to change the degree objective to that of the doctorate, it will be necessary to reapply for that particular program.

Physical Education

P.E.

- 221. *Advanced Athletic Training. I.* 3 hr. PR: P.E. 121, 164, 165; and Saf. S. 70 or consent. In-depth analysis of preventive measures and treatment procedures and practical experience using therapeutic modalities. Laboratory work included.
- 222. *Advanced Athletic Training. II.* 3 hr. PR: P.E. 221 or consent. Designed to analyze management procedures related to athletic training and provide practical experience in diagnosing and treating athletic injuries. Laboratory work included.
- 223. *Athletic Training Practicum. II.* 3 hr. PR: Junior standing. A practical application of athletic training techniques. Laboratory work included.
- 225. *Program Planning of Recreational Sport. I, II, S.* 3 hr. PR: Graduate standing or consent. An in-depth study of recreational sport programs, including philosophy, objectives, program development, management concepts, and evaluation.
- 300. *Workshop in Physical Education. I, II, S.* 1-15 hr.
- 305. *Philosophical Concepts in Physical Education. I, S.* 3 hr. PR: Graduate standing or consent. Study of educational philosophies and application of these philosophies to physical education; study of the place of physical education in education and modern living.
- 315. *Research Methodology in Physical Education. I, S.* 3 hr. PR: Graduate standing or consent. Application of historical, descriptive, and experimental research strategies and designs to physical education.
- 320. *Individual Interaction in Sport and Physical Activity. I, S.* 3 hr. PR: Graduate standing or consent. Designed to acquaint the student with the reciprocal relationships between sport and physical activity and the societies and cultures out of which sport emerges.

340. *Psychology of Sport and Physical Activity*. I, S. 3 hr. PR: Graduate standing or consent. Psychological effects and implications of man's participation in sport and physical activity. Emphasis on the personality and motivational dynamics of sport involvement.
345. *Group Influences in Sports*. I. 3 hr. PR: Research, Statistics, P.E. 320, 340. The manner and degree to which selected individuals are affected by involvement in sport and group interactions.
360. *Biomechanical Analysis of Sport and Physical Activity*. II, S. 3 hr. PR: P.E. 164 and 165 or equiv., or consent. Advanced principles of body mechanics and analysis of muscle and joint actions in coordinated movement and neuromuscular physiology.
365. *Psychomotor Behavior Analysis*. II, S. 3 hr. PR: Graduate standing or consent. In-depth study of psychomotor learning with emphasis on behavioral change in physical activity. Review of research and psychological thought pertinent to motor learning, performance, and physical activity.
367. *Theories of Sport Physiology*. I, S. 3 hr. PR: Doctoral standing. Thorough and workable knowledge of principles involved in the interactions of muscles and nerves, reflexes, metabolism, cardiopulmonary function, environmental physiology, and the practical application of work physiology.
380. *History of Sport and Physical Activity*. II, S. 3 hr. PR: Graduate standing or consent. Anthropological and historical approach toward the influence of events, political and social climates, and personalities upon the sport cultures from early civilizations to present.
425. *Educational Sport*. II. 3 hr. PR: Stat. 311, P.E. 306, 465. The group dynamics of the sport situation for purposes of gaining insight into techniques and methods of modifying social behavior through physical education sport activities.
445. *Program Planning*. II, S. 3 hr. PR: Graduate standing or consent. An in-depth study of the manner in which the physical education environment is structured to elicit cognitive and psychomotor learnings. Emphasis on program design, behavior modification, and evaluation processes.
446. *Advanced Measurement in Physical Education*. II, S. 3 hr. PR: Graduate standing. Extension and application of basic concepts of statistical evaluation to physical education.
460. *Management Processes in Physical Education*. II. 3 hr. PR: Doctoral standing or consent. Analytical exploration of the situational, relational processes between the administrator of physical education school programs and the teacher of physical education, the physical education facility, and the physical education planned learning environment.
465. *Professional Physical Education Resource Seminar*. S. 3 hr. PR: Doctoral standing. Introductory seminar for doctoral professional physical educators. Discussions and readings of current thought about physical education in its historical perspective.
480. *Dissertation Seminar*. I, II, S. 3 hr. PR: Advanced doctoral standing. Critical analysis of the doctoral candidate's research proposal.
490. *Teaching Practicum*. I, II, S. 3-15 hr.
491. *Advanced Study*. I, II, S. 1-6 hr.
- 492-495. *Special Seminars*. I, II, S. 1-6 hr. ea.
496. *Graduate Seminar*. I, II, S. 1-6 hr.
497. *Research*. I, II, S. 1-15 hr.
498. *Thesis*. I, II, S. 1-15 hr.
499. *Colloquium*. I, II, S. 1-6 hr.

Dance

- 301. *Rhythms and Dance*. I, S. 3 hr. PR: Graduate standing and consent. Principles of movement, materials, and practicum in dance.
- 302. *Modern Dance Techniques and Composition*. II, S. 3 hr. PR: Dance 35 and 37 or equiv., graduate standing or consent. Scientific principles of movement; basic principles of music as related to dance movement; choreographic principles; practicum in dance movement. Principles for teaching dance and problems involved in planning program.
- 303. *American Folk Dance*. I, S. 3 hr. PR: Dance 39 or equiv. American square, contra, circle, and round dance, and their relationships in the arts and aspects of American culture. Analysis of techniques in leading and calling.
- 304. *History and Philosophy of Dance*. II, S. 3 hr. PR: Dance 302 or equiv. Cultural survey of dance as an expression of the society it represents; philosophy of dance; relation of dance to other art forms; dance as an educational experience.

Environmental and Occupational Health Studies

Env. H.

- 320. *Foundations of Environmental Health Practice*. I, II, S. 4 hr. PR: Consent. Designed to enable the environmentalist to recognize and identify environmental stresses and the effect of these stresses on man. Topics include occupational health, physical stress, safety, and basic and broad principles of toxicology.
- 321. *Epidemiology: Principles and Practices*. I, II, S. 2 hr. PR: Stat. 311 or equiv. Principles and methods of epidemiology with emphasis on descriptive and analytical epidemiological methods.
- 325. *Environmental Health Analysis*. I, II, S. 3 hr. PR: Consent. Intensive and comprehensive practical training in environmental health methods to include instrumentation for quantitative and qualitative detection, evaluation, and control of chemical, physical, and biological health hazards.
- 326. *Environmental Health Sampling*. I, II, S. 3 hr. PR: Consent. Intensive and comprehensive practical training in environmental health sampling of chemical, physical, and biological health hazards.
- 380. *Internship*. I, II, S. 3-6 hr. (May be repeated.) PR: Approval of committee chairman and department chairman. Professional internship provided on-the-job training under supervision of a previously approved environmentalist in settings appropriate to professional objectives.

Safety Studies

Saf. S.

- 231. *Safety in Motor Transportation Services*. II. 3 hr. PR: Saf. S. 131 or consent. Safety elements of automotive transportation equipment. Design, operation, planning and control plus effects of legislation. The school motor fleet is highlighted.
- 232. *Safety Education Principles and Content*. I. 3 hr. PR: Saf. S. 131 or consent. Study and analysis of content areas usually recommended for instructional programs within the field of safety, with emphasis on structured learning experiences.
- 254. *Teaching Driver and Highway Safety*. S. 3 hr. PR: Saf. S. 151 or equiv. and valid driver license. Teaching and coordinating driver and highway safety education in schools. Arranged laboratory assures practice in providing behind-the-wheel instruction to beginning drivers.

256. *Driver and Safety Instructional Innovations*. II, S. 3 hr. PR or Conc.: Saf. S. 151 and 254. Multimedia, multivehicle, simulation, and other innovations for classroom and laboratory instruction applied to driver and safety education as revealed by research and current literature.
291. *Special Topics*. I, II, S. 2-6 hr. PR: Consent. Consideration of persistent issues and changing problems in the safety field. Seminar emphasis extends considerable attention to safety interests of participating class members.
300. *Contemporary Safety Beliefs and Foundations*. II, S. 3 hr. Philosophies of the safety movement as expressed by leaders in the field are related to accident causation, accident prevention, and research implications.
310. *Controlling Environmental and Personnel Hazards*. I or II, S. 3 hr. PR: Saf. S. 300 or consent. Investigation of hazard control principles relating to environmental facilities and equipment including control procedures recommended by authorities from the fields of engineering, medicine, and public health as well as from the field of safety.
311. *Accident Countermeasures for Human Factors*. I or II, S. 3 hr. PR: Saf. S. 300 or consent. Investigation of concepts dealing with human behavior as related to accident experience in major categories with consideration of psychological, sociological, and health implications.
330. *Health Hazard Loss Control Management*. I, II. 3 hr. PR: Consent. Safety manager utilization of public health, legislative, industrial hygiene, engineering, medical, nursing, and education resources designed for identifying, controlling, and minimizing occupational health hazards and related losses.
333. *Disaster Preparedness and Emergency Systems*. I or II, S. 3 hr. PR: Saf. S. 300 or consent. Major elements involved in disasters and emergencies, preparedness planning, systems utilization, and attention to essential human services, with emphasis on community action.
334. *Establishing and Managing Fire Services*. I or II, S. 3 hr. PR: Saf. S. 300 or consent. Analysis of fire services usually provided under safety manager jurisdiction, with special attention to legal bases, organizational structure, services rendered, training needs, and management techniques.
335. *Safety Legislation and Compliance Operations*. I, S. 3 hr. PR: Saf. S. 300 or consent. Comprehensive study and analysis of federal and state legislation which mandates compliance with certain safety conditions and practices related to work performed in occupational and comparable settings.
336. *Safety and Loss Control Management*. I, S. 3 hr. PR: Saf. S. 300 or consent. Management guidelines, functional standards, and operational features applicable to safety and loss control programs designed for business, governmental, industrial, and educational enterprises.
339. *Security Management Practices and Problems*. I or II, S. 3 hr. PR: Saf. S. 300 or consent. Safety manager responsibilities for security of persons and property including organizational patterns, personnel competencies expected, surveillance and monitoring methods, and occupational problems among security personnel.
418. *Safety, Measurement, Evaluation, and Research*. II, S. 3 hr. PR: Saf. S. 300. Analysis of evaluative data and statistical procedures applicable to the safety field plus investigation of nature and purposes of research dealing with safety and accident prevention with emphasis on human and environmental factors.
452. *Manpower Development for Safety Responsibilities*. II. 3 hr. PR: Graduate standing in Safety Studies and consent. Safety manpower positions, needs and problems in relation to efforts by business, industrial, governmental and educational agencies to provide sufficiently effective professional and sub-professional preparation of safety practitioners.

457. *Planning and Coordinating Safety Programs*. I, 3 hr. PR: Advanced graduate standing in Safety Studies or consent. Organizational structure, planning resources and techniques, and coordination functions involving safety program in business, industry, government, and education.
459. *Directed Study*. I, II, S. 1-6 hr. PR: Doctoral level standing and consent. Analysis of research designs and procedures for compilation, organization, treatment, and interpretation of data for safety research projects. (Required of all candidates for doctoral degrees in Safety Education.)
472. *Practicum*. I, II, S. 1-6 hr. PR: Graduate standing in Safety Studies and consent. Individual and/or group experiences in development, implementation, and participation in special projects involving safety education, safety services, and environmental safety in schools, colleges, or communities.
490. *Teaching Practicum*. I, II. 3-15 hr.
491. *Advanced Study*. I, II, S. 1-16 hr.
- 492-495. *Special Seminars*. I, II, S. 1-6 hr. each.
496. *Graduate Seminar*. I, II, S. 1-3 hr.
497. *Research*. I, II, S. 1-15 hr.
498. *Thesis*. I, II, S. 1-15 hr.
499. *Colloquium*. I, II, S. 1-6 hr.

Social Work

The graduate program in social work, accredited by the Council on Social Work Education, leads to the degree of Master of Social Work (M.S.W.) It normally requires two academic years and one summer for completion. The School of Social Work offers an Advanced Standing Program which allows students with certain educational qualifications to complete the program in two academic semesters and a summer session.

Social work, one of the oldest human service professions, is based upon social and behavioral science information which is used to understand and provide the basis for helping individuals, groups, and communities. Social work practitioners help people with personal, economic, social, political, and intergroup problems.

Graduate social work study involves classroom and field studies. Students spend two semesters and a summer in classroom study. In addition, the student spends two full semesters in block field instruction placements that are carefully selected to provide learning opportunities under the guidance of experienced professionals.

The WVU social work program concentrates on preparation of people for leadership positions in rural and small communities, particularly those in the Appalachian region, which offer unique opportunities to study and work with changing social environments. The region faces out-migration and in-migration trends with all the personal adjustment and social organization problems such trends involve.

Most field instruction is provided in the Appalachian region or in agencies serving the region. Much of the classroom content focuses on the region and on studies designed to help students understand it.

A Pennsylvania State University study of nationally innovative programs in professional education cited the WVU School of Social Work as focusing "on

social change by using field work in Appalachia as the laboratory for testing the change theories of the classroom.”

Graduates are employed throughout the United States and Canada. They work as individual and family therapists, as group treatment specialists, community organizers, social researchers, social work educators, and administrators in a variety of programs, such as mental health clinics, hospitals, correctional institutions, courts, delinquency programs, aging programs, family counseling agencies, children's protective agencies, public welfare departments, child development programs, manpower agencies, public schools, community action agencies, settlement houses, city governments, state government planning agencies, federal administrative agencies, and private research and development organizations concerned with human problems. There has been a constant growth in the need for professional social workers. It is anticipated by the Bureau of Labor Statistics and other research bodies that the demand for social workers will continue to increase in numbers required and in varieties of programs in which social workers are employed. The WVU social work curriculum is designed to help students prepare for these careers. Students are required to work closely with their academic advisers in selecting appropriate components of class and field learning to meet their individual needs.

Curriculum

The five major instructional components in the Master of Social Work program are human behavior and the social environment, practice, social welfare policy and services, field instruction, and research.

Human Behavior and the Social Environment

The social worker is concerned with human behavior as it is manifested in the individual, in groups, and in communities. To understand these kinds of social phenomena, concepts from sociology and anthropology, psychology, and behavioral medicine and psychiatry have been selected for study. They are applied to an interpretation of conformity and deviance, including behavior such as overcompliance, neuroses, delinquency, mental illness, anomie, and alienation.

Social Work Practice

The School of Social Work program emphasizes a comprehensive approach to social work practice. The student becomes a “specialized generalist” capable of understanding and actively engaging in a wide array of professional behaviors.

Throughout the first year, the student learns a comprehensive approach to social work practice, utilizing foundation principles, techniques, and values to practice social work with social systems of various sizes — from individuals to communities — as particular tasks require.

In the second year the student develops specialized expertise to complement generalist capacities by electing a concentration in either social work practice affecting individuals, families, and groups, or in social planning and community development.

A variety of options allows the student to concentrate on a program of study in social welfare planning, community organization and development, policy analysis, and program development and administration. Knowledge and skills in these areas are increasingly desirable in many of the newly emerging local,

regional, and state planning structures, and in human resource development programs in such areas as health, child development, corrections, cooperative extension work, and others. A number of professional positions are emerging. Students interested in such careers should consult with faculty members who have knowledge of the community organization and planning fields to construct a course of study that will enable them to seek and fill such positions after graduation. The School of Social Work maintains field placements in a variety of such settings so as to provide the student with maximum opportunity to combine the theoretical knowledge of the classroom with the problem oriented tasks of the traditional and newer settings.

Research

The research curriculum gives the student technical knowledge in contemporary social science research methods, statistics, and computer usage as these have relevance to understanding and developing the knowledge requirements of social work practice. Emphasis is placed on application of research concepts to social work practice as a problem-solving activity, on conduct of research, and on assessment and utilization of the findings of contemporary social science.

All students who are candidates for the master's degree in social work must take an introductory course in statistics, an introductory course in social research methods, and one advanced research course (all other research courses except the two introductory courses). Students who have had either or both of the introductory courses on an undergraduate level may be excused from either or both of the introductory courses by passing qualifying examinations in these subject areas at the time of admission. However, advanced standing students who have taken these introductory research courses as a part of a graduate degree program in a related field are automatically exempt from either or both of these introductory requirements. All students must take a minimum of one advanced research course, while students who have not had research or statistics courses of any nature must take a minimum of 9 semester hours of research (three courses), including the introductory statistics course and the introductory course in social research methods.

Social Welfare Policy and Services

Emphasis throughout the social welfare policy and services courses is placed upon values, conflict of interest, professionalism, history, ideology, economics, and socio-legal-political change as they relate to policy formation, and the tasks, resources, and roles of the social work professional. The courses deal with an analysis of the creation, institutionalization, and planning of social welfare policy and service in a democracy. Extensive consideration is given to selected social problems, such as poverty, health, family planning, crime, housing, urban decay, redistribution of political and economic power, socioeconomic problems of Appalachia, and planning the future, as they affect and are affected by policy formulation, analysis, and implementation.

Field Instruction

Field instruction is an integral part of the social work program. Primary consideration in making field instruction assignments is in the selection of field settings and locations which can fulfill the educational goals and objectives of the School of Social Work and which can meet the particular educational needs of the

student. Consideration is given to the student's area of interest, family situation, and stipend requirement.

In the first and second years, students take field instruction during two alternating semesters. These field teaching and learning experiences are provided by field instructors who may be employed by the School of Social Work or who may be members of an agency staff. All field instructors work closely with faculty consultants.

The learning experiences assist the student in acquiring abilities for integrated practice and in developing the discipline and self-awareness essential to a professional social worker. Students select from a wide range of innovative practice settings which utilize both traditional and nontraditional approaches. While in the field, students are expected to both provide services to people and to learn from their involvement with human problems. Examples of the nontraditional approaches available include the linkage between graduate and undergraduate field instruction units and the evaluation and initiation of new manpower utilization programs.

A recent innovation in the field instruction program has been the opportunity for overseas placements. Students have been assigned primarily in London, England, with the collaboration of the Camden Borough of greater London. There are also field experience opportunities in Colombia, South America.

Field Instruction Agencies, 1977

Aging Project, WVU School of Social Work.
Allegany County Health Department, Cumberland, MD.
Area Agency on Aging, Monessen, PA.
Appalachian Mental Health Center, Elkins, WV.
Appalachian Mental Health Center, Keyser, WV.
Appalachian Regional Hospital, Beckley, W.V.
Bellaire Clinic, Bellaire, OH.
Brooke-Hancock Group Home, Newell, WV.
Burlington United Methodist Children's Home, Burlington, WV.
Center on Alcoholism and Drug Abuse, Morgantown, WV.
Centerville Memorial Clinic, Fredericktown, PA.
Central Intake Services, Multi-Service Center, Wheeling, WV.
Charleston Job Corps Center, Charleston, WV.
Child Development Project, Interagency Council for Child Development, Charleston, WV.
Children and Family Association, Wheeling, WV.
Chit Chat Foundation, Wernersville, PA.
Circuit Court of Kanawha County, Adult Probation Department, Charleston, WV.
Commission on Mental Retardation, Charleston, WV.
Community Mental Health Learning Center, WVU School of Social Work.
Community Mental Health Service, St. Clairsville, OH.
Community Mental Health Training Program, WVU School of Social Work.
Concord College, Athens, WV.
Conemaugh Valley Memorial Hospital, Johnstown, PA.
Continuing Education, WVU School of Social Work.
Department of Behavioral Medicine and Psychiatry, WVU Medical Center — Charleston Division, Charleston, WV.
Department of Behavioral Medicine and Psychiatry, WVU School of Medicine.
Fairmont Clinic, Fairmont, WV.
Family Education Center, WVU Department of Counseling and Guidance.
Family Service Association, Morgantown, WV.
Family Service of Kanawha Valley, Charleston, WV.
Fayette County Outreach to Children and Their Families, Uniontown, PA.
Federal Reformatory for Women, Alderson, WV.

Hancock-Brooke Mental Health Service, Weirton, WV.
 Health and Welfare Planning Association, Pittsburgh, PA.
 Housing Authority of the City of Charleston, WV.
 John F. Kennedy Institute, Baltimore, MD.
 Legal Aid Society, Morgantown, WV.
 Manpower Planning and Evaluation Project, WVU School of Social Work.
 Maternal and Infant Care Project, Morgantown, WV.
 Mid-Ohio Alcoholism Rehabilitation Center, Cambridge, OH.
 Mon Valley United Health Services, Inc., Monessen, PA.
 Monongalia County Schools, Morgantown, WV.
 Mountain Community Union, Fairmont, WV.
 National Association of Social Workers, Washington, DC.
 Neighborhood Family and Children's Services, Parkersburg, WV.
 North Central West Virginia Community Action Association, Fairmont, WV.
 Northern Panhandle Mental Health Center, Wheeling, WV.
 Overseas Placement, WVU School of Social Work.
 Pennsylvania Board of Probation and Parole, Harrisburg, PA.
 Pittsburgh Job Corps Center, Pittsburgh, PA.
 Region VI, Agency on Aging, Fairmont, WV.
 Ridgway Area Psychiatric Center, Ridgway, PA.
 Robert F. Kennedy Center, Morgantown, WV.
 Somerset-Bedford Mental Health/Mental Retardation Program, Rockwood, PA.
 South Hills Inter-Faith Ministries, Pittsburgh, PA.
 Spencer State Hospital, Spencer, WV.
 Stonewall Jackson Memorial Hospital, Weston, WV.
 Undergraduate Social Work Program, School of Social Work, WVU.
 United Mine Workers of America, Morgantown, WV.
 United Way of Beaver County, Beaver, PA.
 Valley Comprehensive Community Mental Health Centers, Fairmont/Morgantown/
 Kingwood, WV.
 Veterans Administration Center, Martinsburg, WV.
 Veterans Administration Hospital, Chillicothe, OH; Clarksburg, WV; Erie, PA; Hunting-
 ton, WV; Oakland, PA; Pittsburgh, PA.
 Warren State Hospital, Warren, PA.
 Washington County Board of Assistance, Washington, PA.
 Weston State Hospital, Weston, WV.
 West Virginia Department of Welfare; Charleston, Romney, Summersville, and Wheeling,
 WV, offices.
 WVU Medical Center, Geriatrics Clinic, Morgantown, WV.
 Youth Development Center, Loysville, PA.
 Youth Development Center, Waynesburg, PA.

Admission

Students are admitted to graduate study in the School of Social Work who meet all of the following requirements:

1. Graduation with a bachelor's degree from any accredited college or university.
2. Proof of academic achievement. Graduate School regulations require an undergraduate grade-point average of at least 2.5 for approval of candidates as *regular* graduate students. An undergraduate grade-point average less than 2.5 will be classified as *special-provisional* for those admitted.
3. Evidence of potential to practice social work, such as commitment to human service, and concern about and ability to work effectively with people.

Admission With Advanced Standing

Students may request up to one year's advanced standing if they meet the regular requirements of the Graduate School and the School of Social Work. In addition, applicants must:

1. Have received a baccalaureate degree in social work or social welfare awarded by an accredited college or university which is a constituent member of the Council on Social Work Education.
2. Have a highly ranked academic background (approximately a 3.0 cumulative grade-point average on a 4.0 scale.)
3. Have received a master's degree in an allied field from an accredited college or university.

In addition to the above requirements, paid work experience in a human services area also is considered desirable.

Request for advanced standing must be made at the time of application and approved by the Admissions Committee. Applicants who are granted one year of advanced standing will register to begin with the summer session and must complete that session plus no less than two additional semesters of graduate-level work. Disapproval of requests for advanced standing will not prohibit acceptance into the regular, full two-year program.

Part-Time Program

Applicants may elect to extend their graduate program up to a maximum of four years by specifically requesting part-time status in their application for admission. To be accepted, the student must meet WVU and School of Social Work entry requirements, have a definite objective of completing the master's program within a four-year period, and present an acceptable plan for completing requirements.

Transfer Students

Students who have completed graduate social work courses in other accredited schools of social work may apply for admission. If one year of such full-time study has been successfully completed, an applicant would be expected to begin with the summer session, complete it plus two additional semesters of full-time graduate-level work to earn the degree of Master of Social Work.

Recommended Application Date

Applicants are urged to complete their applications *before February 1st*, in order to guarantee their consideration for admission and for financial aid. First-year students are admitted *only* in the first semester of each academic year. Students admitted to the program with advanced standing or second-year status *must enter* in the summer session.

Requirements for Master of Social Work

The degree of Master of Social Work (M.S.W.) is conferred by the University upon those students who satisfactorily complete the requirements as established by the Graduate School. These requirements are:

1. *For students enrolled in the regular, 21-month M.S.W. program:* Satisfactory completion of no less than 67 semester hours which may have been

earned through the WVU School of Social Work, West Virginia College of Graduate Studies, WVU off-campus credit program, or through approved graduate courses completed in other accredited institutions. Exceptions in this category would pertain to candidates whose degree plans required them to register for less than 28 semester hours of field instruction or for candidates whose earned credits entitled them to exemptions for certain courses. Candidates who transfer from other accredited graduate social work programs are required to successfully complete no less than 61 semester hours (since equivalent credit hours from other institutions may not match that which is offered by WVU).

2. *For students enrolled in the Advanced Standing, 11-month M.S.W. program:* Satisfactory completion of no less than 38 semester hours of approved graduate courses at WVU including a full semester of field instruction plus other required courses together with electives and/or substitutions for approved graduate courses in the School of Social Work.

3. Students may request credit for up to 6 hours earned in graduate study in approved courses taken in other divisions of WVU; through graduate social work off-campus credit courses, or approved courses from other accredited universities. Such requests must be made at the time of application for admission and approved at that time, for students to be able to claim such credit toward the requirements for the M.S.W. degree.

4. Satisfactory completion of all components of the graduate program.

5. A cumulative average of at least 2.75 for the total graduate program.

A TYPICAL GRADUATE SOCIAL WORK COURSE LOAD

First Year

<i>First Semester</i>	<i>Hr.</i>
S.W. 321 — Human Behavior and Social Environment I	4
S.W. 331 — Social Welfare Policy and Services I	3
S.W. 340 — Introduction to Social Work Practice	5
S.W. 497 — Research I (Introduction to Social Research Methods or Introduction to Statistics)	3
	<hr/> 15

<i>Second Semester</i>	<i>Hr.</i>
S.W. 381 — Field Instruction I	5-14

Second Year

<i>Summer Session</i>	<i>Hr.</i>
S.W. 322 — Human Behavior and Social Environment II <i>and/or</i>	2
S.W. 332 — Social Welfare Policy and Services II	2
S.W. 341 — Practice Affecting Individuals, Families, and Small Groups	2
S.W. 351 — Practice Affecting Organizations, Institutions, and Communities	2
S.W. 497 — Research II (Survey Design and Analysis <i>or</i> Principles of Program Design and Evaluation)	3
	<hr/> 8-11

<i>First Semester</i>	<i>Hr.</i>
S.W. 481 — Advanced Field Instruction II	5-14

Second Semester

The following are recommended courses for the second semester. Within the recommended courses, all students are allowed to take one elective. One practice course (either S.W. 441 or 451) is required and the research course is required. Students, with the approval of their advisers, may take other electives, within or outside of the WVU School of Social Work. It is conceivable that one could also take both S.W. 441 and 451 under such a plan, if desired.

	<i>Hr.</i>
S.W. 421 — Human Behavior and the Social Environment III	2
S.W. 431 — Social Welfare Policy and Services III	2
S.W. 441 — Advanced Practice Affecting Individuals, Families, and Small Groups <i>or</i>	3
S.W. 451 — Practice in Advanced Planning and Social Development Strategies	3
S.W. 460 — Social Work Management	3
S.W. 380 — Special Topics (Elective) <i>or</i>	2-3
S.W. 480 — Seminar (Elective)	2-3
S.W. 497 — Research III (Research Methodology in Community and Organizational Studies <i>or</i> another advanced course)	3

All full-time students must carry a minimum of 13 hours and five courses during the final semester.

Social Work

S.W.

- 321. *Human Behavior and the Social Environment I.* 1-6 hr. Provides a foundation of selected theoretical approaches to the behavior of individuals, small groups, organizations, and communities through topical sections. Application to social work practice demonstrated by examining material on Appalachia, poverty, and discrimination.
- 322. *Human Behavior and the Social Environment II.* 2 hr. Objective is to increase understanding of organizations, communities, and small groups as they develop, change, and affect behavior of those affiliated with them.
- 331. *Social Welfare Policy and Services I.* 3 hr. Processes of policy formation, with emphasis on inputs and outputs and its key role in shaping American social welfare programs.
- 332. *Social Welfare Policy and Services II.* 2 hr. Develops knowledge and skill in the range of analytic tools and their effective use for policy formation, implementation, realignment, and planning futuristic alternatives. Determining policy objectives, acquiring social intelligence and indicators, and the dilemmas of decision theory and practice.
- 340. *Introduction to Social Work Practice.* 5 hr. Basic concepts underlying generic social work practice. Introduction to practice skills is provided: a. Helping individuals, families, and small groups; b. Community development, planning and organizing; c. Management and administration.
- 341. *Practice Affecting Individuals, Families, and Small Groups.* 2 hr. The restoration, maintenance, or enhancement of social functioning of individuals, families, and small groups utilizing methodological approaches — both old and new.
- 351. *Practice Affecting Organizations, Institutions, and Communities.* 2 hr. Students develop knowledge and skill in enhancing the functioning of a variety of social systems; task groups, neighborhood, community (rural and urban), and organization.
- 375. *Individual Consultation.* 1-3 hr. PR: Consent. Individual directed study to develop extensive knowledge in a social work area of student interest.

- 380-1. *Seminar in Manpower: Problems, Policy, Programs.* Student may select some problems, policies, and programs in manpower employment for in-depth study. Focus on appropriate social work interventions for personal change or community development in Appalachian region.
- 380-2. *Social Work Practice As Affected by Racism and Cultural Diversity.* 1-6 hr. An examination of practice implications wherein worker and client are from diverse ethnic and/or sociocultural backgrounds. Ways of reducing the barriers which may exist are explored and solutions are reviewed.
- 380-3. *Women's Studies.* 1-6 hr.
- 380-4. *Staff Development and Training.* 1-6 hr.
- 380-5. *Seminar on Drugs: Implications for Social Work Practice.* 1-6 hr. Acquaints students with the history and nature of drug usage in modern society; current definitions of drug usage: medical, psychological, law enforcement, socio-cultural; range and kinds of treatment resources and gaps in these resources; examine and understand the practice dilemmas posed by drug problems for social work interventions.
381. *Field Instruction I.* 5-14 hr. Field instruction and practice in selected settings under general direction of the faculty.
421. *Human Behavior and the Social Environment III.* 2 hr. The understanding of behavior is extended by review of previous materials and their application to experiences from field work. Student projects facilitate the integration of materials from different curriculum areas.
431. *Social Welfare Policy and Services III.* 2 hr. Emphasis on further developing skills in policy analysis. Specific policy issues are selected for intensive, comprehensive study, building on knowledge and skills gained from S.W. 331-332.
441. *Advanced Practice Affecting Individuals, Families, and Small Groups.* 3 hr. A seminar format dealing with variety of student needs. Emphasizes the student's style of helping as gleaned from exposure to various methodologies and field instruction experience.
451. *Practice in Advanced Planning and Social Development Strategies.* 3 hr. A study of planning techniques for selected programs, i.e., housing, health; accompanied by appropriate structuring of organizations to implement planning; and theories of social development and effective social action.
460. *Social Work Management.* 3 hr. An intensive examination of the concepts, principles and skills of administration, consultation, supervision, and teaching in social work practice.
- 480-1. *Seminar in Social Work Practice With Task Action Groups.* 1-6 hr. A seminar that permits skill development in work with agency boards, community advisory committees, autonomous community self-help or action groups, staff committees, planning groups or bodies.
- 480-2. *Criminal Victimization and Social Work Practice.* 1-6 hr. A social, psychological, and legal introduction to victimization and victimology; skills in helping process victims through the justice system; victim prevention and treatment policies and programs.
- 480-3. *Professional Writing for Social Workers.* 2 hr. Functions and responsibilities of article writing and publishing, manuscript analysis, and editorial decision factors. Students are required to produce, edit, and publish the school's journal — *The West Virginia Journal of Social Welfare.*
- 480-4. *Sexual Problems and Social Work Practice.* 1-6 hr. Teaches skills in diagnosing and treating sexual dysfunctions and policy analytic skills around such policies as sex education, contraception, alternate sexual lifestyles, and sex offenders.

- 480-5. *Child Development Services and Issues*. 2 hr. Provides students with an in-depth study of current issues and practices in child development social services: day care, protective services, foster care, public school services, etc.
- 480-6. *Service Planning for the Aged*. 2 hr. Application of planning models to needs and services with aged groups, legislation, and service systems.
- 480-7. *Deviance Theory and Social Work*. 2 hr. Critical analysis of deviance theory and its ethical basis as applied to mental health and criminal justice systems.
- 480-8. *Community Mental Health Issues*. 2 hr. Analyzes the shift from institutions to community approaches and the evaluation of community health programs.
- 480-9. *Applied Research in Community Mental Health*. 2 hr. Focuses on the enhancement of research skills for use in mental health settings, with emphasis on computer science.
- 480-10. *Minority Victimization*. 2 hr. Practice, policy, and alternatives with American minorities — racism, sexism, ageism, and heterosexuality.
481. *Advanced Field Instruction II*. 5-14 hr.
497. *Introduction to Social Research Methods*. 3 hr. Basic concepts in social research methods. Emphasis on conceptualization of social work problems for research, role of social science theories in research, measurement, options in research design, and analysis of data.
- 497-1. *Introduction to Statistics*. 3 hr. Descriptive and inferential statistics and their application to practice problems. Analytic techniques include non-parametric and parametric statistics through the analysis of variance. Laboratory exercise designed to simulate practice problems.
- 497-2. *Survey Design and Analysis*. 3 hr. Seminar covers basic designs in quantitative-descriptive research, sample design, and computerized social data analysis using the Data-Text System. Seminars alternated with laboratory sessions. Students are encouraged to generate their own data for analysis.
- 497-3. *Principles of Program Design and Evaluation*. 3 hr. Application of research methods to design of experimental social programs and their evaluation. Students design an experimental social program.
- 497-4. *Research Methodology in Community and Organizational Studies*. 3 hr. Seminar covers research strategies and methodological problems related to the organization and delivery of services at the community level. Particular emphasis on the social problems, organizational and administrative patterns, decision-making structures, and the like.
- 497-5. *Special Topics*. 1-6 hr. Provides a variety of special arrangements with students, as individuals or in small groups, such as tutorials, the implementation of research projects, and the like. Admission by permission of the research faculty.
- 497-6. *Research Utilization*. 3 hr. A seminar devoted to a critical analysis of contemporary research in the social sciences and in social welfare as this relates to social work practice.

Part 5

GRADUATE FACULTY

College of Agriculture and Forestry

Interdivisional Committee of Agricultural Biochemistry

Bradford C. Bearce, Ph.D. (U. Cal.), *Professor of Horticulture and Agricultural Biochemistry.*

James L. Brooks, Ph.D. (U. Cal.), *Associate Professor of Agricultural Biochemistry.*

Morris Ingle, Ph.D. (Purdue U.), *Professor of Horticulture and Plant Biochemistry.*

Walter J. Kaczmarczyk, Ph.D. (Hahnemann Med. C.), *Professor of Genetics and Agricultural Biochemistry.*

George A. McLaren, Ph.D. (Okla. St. U.), *Professor of Agricultural Biochemistry and Nutrition.*

William G. Martin, Ph.D. (WVU), *Professor of Agricultural Biochemistry.*

Robert L. Reid, Ph.D. (Aberdeen U.), *Professor of Animal Nutrition and Agricultural Biochemistry.*

David A. Stelzig, Ph.D. (N.D. St. U.), *Professor of Plant Pathology and Agricultural Biochemistry.*

Valentin Ulrich, Ph.D. (Rutgers U.), *Professor of Genetics and Agricultural Biochemistry.*

Animal and Veterinary Sciences

Alfred L. Barr, Ph.D. (Okla. St. U.), *Professor of Agricultural Economics; Chairman.*

Gerald C. Anderson, Ph.D. (U. Mo.), *Professor of Animal Science.*

Dan L. Cunningham,* Ph.D. (VPI & St. U.), *Assistant Professor and State Extension Specialist—Poultry Science.*

Robert A. Dailey, Ph.D. (U. Wisc.), *Assistant Professor of Animal Science.*

Leslie Dozsa, D.V.M. (C. Vet. Med., Budapest), *Professor of Veterinary Sciences.*

Robert S. Dunbar, Jr., Ph.D. (Cornell U.), *Professor of Animal Science.*

Joseph R. Escoubas, Ph.D. (Okla. St. U.), *Assistant Professor of Animal Science.*

Donald J. Horvath, Ph.D. (Cornell U.), *Professor of Animal Science.*

E. Keith Inskeep, Ph.D. (U. Wisc.), *Professor of Animal Science.*

Robert O. Kelley, Ph.D. (U. Mo.), *Associate Professor and State Extension Specialist—Dairy Science.*

Harold E. Kidder, Ph.D. (U. Wisc.), *Professor of Animal Science.*

Marvin R. McClung, Ph.D. (Iowa St. U.), *Professor of Animal Science.*

George A. McLaren, Ph.D. (Okla. St. U.), *Professor of Nutritional Biochemistry.*

William G. Martin, Ph.D. (WVU), *Professor of Agricultural Biochemistry.*

Norman O. Olson, D.V.M. (Wash. St. U.), *Professor of Veterinary Sciences.*

John B. Peters, Ph.D. (U. Wisc.), *Associate Professor of Animal Science.*

Ronald A. Peterson, Ph.D. (Mich. St. U.), *Associate Professor of Animal Science.*

Robert L. Reid, Ph.D. (Aberdeen U.), *Professor of Animal Nutrition and Agricultural Biochemistry.*

Roy O. Thomas, Ph.D. (Mich. St. U.), *Associate Professor of Dairy Science.*

Benjamin W. Wamsley, Jr.,* M.S. (WVU), *Associate Professor and State Extension Specialist—Animal Science.*

James A. Welch, Ph.D. (U. Ill.), *Professor of Animal Science.*

Frank F. Woodson,* D.V.M. (Ohio St. U.), *Professor of Veterinary Science.*

Dale W. Zinn, Ph.D. (U. Mo.), *Professor of Animal Science; Dean, Agriculture and Forestry; Director, Agricultural and Forestry Experiment Station.*

*Associate member.

Forestry

- Wallace W. Christensen, Ph.D. (SUNY—Syracuse), *Professor and Chairman*.
Eugene C. Bammel,* Ph.D. (Syracuse U.), *Assistant Professor of Recreation and Leisure Studies*.
Lei L. Bammel,* Ph.D. (U. Utah), *Assistant Professor of Recreation and Leisure Studies*.
Samuel M. Brock, Ph.D. (U. Minn.), *Associate Professor of Forest Economics*.
Kenneth L. Carvell, D.F. (Duke U.), *Professor of Silviculture*.
Franklin C. Cech, Ph.D. (Tex. A&M U.), *Professor of Forest Genetics*.
John D. Gill,* M.S. (Mich. St. U.), *Assistant Professor of Wildlife Management*.
John R. Hamilton, Ph.D. (N.C. St. U.), *Professor of Wood Science*.
Joseph M. Hutchison, Jr.,* M.S. (WVU), *Associate Professor of Recreation*.
Norman D. Jackson,* M.W.T. (N.C. St. U.), *Assistant to the Chairman; Associate Professor of Wood Science*.
Eitley P. Jenkins,* M.S. (WVU), *Associate Professor of Wood Science*.
Christian B. Koch, Ph.D. (U. Mich.), *Professor of Wood Science*.
Richard Lee, Ph.D. (Colo. St. U.), *Professor of Forest Hydrology*.
Edwin D. Michael, Ph.D. (Tex. A&M U.), *Professor of Wildlife Biology*.
David E. Samuel, Ph.D. (WVU), *Associate Professor of Wildlife Management*.
Bruce A. Schick,* Ph.D. (SUNY), *Assistant to the Chairman; Associate Professor of Forest Economics*.
Earl H. Tryon, Ph.D. (Yale U.), *Professor of Silviculture*.
Ben W. Twight,* Ph.D. (U. Wash.), *Associate Professor of Forest Recreation*.
David E. White, Ph.D. (SUNY), *Professor of Forest Economics*.
Robert C. Whitmore,* Ph.D. (B. Young U.), *Assistant Professor of Quantitative Ecology*.
Harry V. Wiant, Jr., Ph.D. (Yale U.), *Professor of Forestry*.
William L. Wylie,* M.S. (WVU), *Assistant Professor of Forestry*.
Gary W. Zinn, Ph.D. (SUNY), *Associate Professor of Forest Management*.

Plant Sciences

- Mannon E. Gallegly, Jr., Ph.D. (U. Wisc.), *Professor of Plant Pathology; Chairman*.
Robert E. Adams, Ph.D. (Cornell U.), *Professor of Plant Pathology*.
Barton S. Baker, Ph.D. (WVU), *Associate Professor of Agronomy*.
John A. Balasko, Ph.D. (U. Wisc.), *Associate Professor of Agronomy*.
Newton M. Baughman, Ph.D. (Purdue U.), *Professor of Agronomy*.
Bradford C. Bearce, Ph.D. (U. Cal.), *Professor of Horticulture and Agricultural Biochemistry*.
Orus L. Bennett, Ph.D. (WVU), *Assistant Professor of Agronomy*.
Gary K. Bissonnette,* Ph.D. (Mont. St. U.), *Assistant Professor of Bacteriology*.
James L. Brooks, Ph.D. (U. Cal.), *Associate Professor of Agricultural Biochemistry*.
Linda Butler, Ph.D. (U. Ga.), *Professor of Entomology*.
Edward S. Elliott, Ph.D. (WVU), *Professor of Plant Pathology*.
Dale F. Hindal,* Ph.D. (Iowa St. U.), *Assistant Professor of Mycology*.
Morris Ingle, Ph.D. (Purdue U.), *Professor of Horticulture and Plant Biochemistry*.
Everett M. Jencks, Ph.D. (Rutgers U.), *Associate Professor of Agronomy*.
Walter J. Kaczmarczyk, Ph.D. (Hahnemann Med. C.), *Professor of Genetics and Agricultural Biochemistry*.
Robert F. Keefer, Ph.D. (Ohio St. U.), *Professor of Agronomy*.
William L. MacDonald, Ph.D. (Iowa St. U.), *Associate Professor of Plant Pathology*.
Harry A. Menser, Jr., Ph.D. (U. Md.), *Assistant Professor of Agronomy*.
Paul G. Moe, Ph.D. (Rutgers U.), *Professor of Bacteriology*.
Joginder Nath, Ph.D. (U. Wisc.), *Professor of Genetics*.
Oliver M. Neal, Ph.D. (Mich. St. U.), *Professor of Horticulture*.
David O. Quinn,* M.S. (WVU), *Professor of Plant Pathology*.
Oscar E. Schubert, Ph.D. (U. Ill.), *Professor of Horticulture*.
Rabindar N. Singh, Ph.D. (VPI & St. U.), *Associate Professor of Agronomy*.
Richard M. Smith, Ph.D. (Ohio St. U.), *Professor of Agronomy*.

Charles B. Sperow, M.S. (WVU), *Professor of Agronomy*.
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Resource Management

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 Russell C. Butler, Ph.D. (Cornell U.), *Professor Emeritus of Agricultural Education and Education*.
 James H. Clarke, Ph.D. (U. Minn.), *Professor of Agricultural Economics*.
 Dale K. Colyer, Ph.D. (U. Wisc.), *Professor of Agricultural Economics*.
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 Kendall C. Elliott, * M.S.Ag.E. (WVU), *Associate Professor of Agricultural Engineering*.
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 Robert L. Jack, Ph.D. (Penn. St. U.), *Professor of Agricultural Economics*.
 Warren G. Kelly, Ed.D. (U. Mo.), *Professor of Agricultural Education and Education*.
 John P. Kuehn, * Ph.D. (U. Tenn.), *Associate Professor of Agricultural Economics*.
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 Ernest J. Nesius, Ph.D. (Iowa St. U.), *Professor Emeritus of Agricultural Economics*.
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 Mary C. Templeton, * M.S. (WVU), *Associate Professor of Agricultural Economics*.
 George E. Toben, M.S. (U. Ill.), *Professor of Agricultural Economics*.

College of Arts and Sciences

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 Herald D. Bennett, Ph.D. (U. Iowa), *Professor*.
 Arnold Benson, * M.A. (U. Colo.), *Assistant Professor*.
 Robert L. Birch, * M.S. (Penn. St. U.), *Assistant Professor*.
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 Roy B. Clarkson, Ph.D. (WVU), *Professor*.
 Jesse F. Clovis, Ph.D. (Cornell U.), *Professor*.
 William E. Collins, Ph.D. (U. Wisc.), *Professor; Dean, Arts and Sciences*.
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 Willis H. Hertig, Jr., Ph.D. (WVU), *Associate Professor*.
 H. William Hunt, Ph.D. (U. Tex.), *Associate Professor*.
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Chemistry

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 John Gruninger, Ph.D. (U. Penn.), *Associate Professor*.
 George A. Hall, Jr., Ph.D. (Ohio St. U.), *Professor*.
 James B. Hickman, Ph.D. (Penn. St. U.), *Professor*.
 George L. Humphrey, Ph.D. (Ore. St. U.), *Professor; Associate Chairman*.
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 B. Jack McCormick, Ph.D. (Okla. St. U.), *Professor*.
 Denis W. H. MacDowell, Ph.D. (MIT), *Professor*.
 Joseph T. Maloy, Ph.D. (U. Tex.), *Associate Professor*.
 Chester W. Muth, Ph.D. (Ohio St. U.), *Professor*.
 Robert S. Nakon, Ph.D. (Tex. A&M U.), *Assistant Professor*.
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 Peter Popovich, Ph.D. (Wash. St. U.), *Professor*.
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 Anthony Winston, Ph.D. (Duke U.), *Professor*.

English

Peter Neumeyer, Ph.D. (U. Cal.), *Professor and Chairman*.
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 Sophia B. Blaydes, Ph.D. (Ind. U.), *Professor*.
 Philip Bordinat, Ph.D. (U. Birmingham, Eng.), *Professor*.
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 Lloyd M. Davis,* M.A. (Vanderbilt U.), *Associate Professor*.
 Richard B. Eaton, Jr., Ph.D. (U. N.C.), *Associate Professor*.
 William P. Fitzpatrick, Ph.D. (U. Md.), *Associate Professor*.
 Ruel E. Foster, Ph.D. (Vanderbilt U.), *Claude Worthington Benedum Professor of American Literature*.
 William W. French, Ph.D. (U. Pitt.), *Associate Professor*.
 Winston E. Fuller,* M.A. (U. Colo.), *Assistant Professor*.
 Avery F. Gaskins, Ph.D. (Ind. U.), *Associate Professor*.
 Elaine K. Ginsberg, Ph.D. (U. Okla.), *Associate Professor*.
 W. Michael Grant, Ph.D. (Brown U.), *Associate Professor*.
 Martha C. Howard, M.A. (U. Mich.), *Associate Professor*.
 John H. Johnston, Ph.D. (U. Wisc.), *Professor*.
 Russell C. MacDonald, Ph.D. (U. Penn.), *Associate Professor*.
 Elizabeth C. Madison,* Ph.D. (Ind. U.), *Assistant Professor*.
 Thomas H. Miles, Ph.D. (SUNY—Binghamton), *Associate Professor*.
 Virgil A. Peterson, Ph.D. (UCLA), *Professor*.
 John Racin, Ph.D. (Ohio St. U.), *Professor*.
 Frank A. Scafella, Jr.,* Ph.D. (U. Chi.), *Assistant Professor*.
 John F. Stasny, M.A. (Marquette U.), *Professor*.
 Judith G. Stitzel, Ph.D. (U. Minn.), *Associate Professor*.

Barry J. Ward,* Ph.D. (Ohio St. U.), *Assistant Professor*.
Hayden W. Ward, Ph.D. (Columbia U.), *Associate Professor*.
Jack L. Welch,* M.F.A. (U. Iowa), *Associate Professor*.

Foreign Languages

Robert J. Elkins, Ph.D. (U. Kans.), *Professor of German; Chairman*.
Michael J. Beauchemin,* M.A. (Brown U.), *Assistant Professor of Romance Languages*.
Marilyn Bendena,* Ph.D. (Wayne St. U.), *Assistant Professor of French*.
Renate Benkert,* Ph.D. (U. So. Cal.), *Assistant Professor of German*.
Laszlo Borsay, Ph.D. (U. Pitt.), *Associate Professor of Classical Languages*.
Axel Claesges,* Ph.D. (Vanderbilt U.), *Associate Professor of German*.
Patricia W. Cummins,* Ph.D. (U. N.C.), *Assistant Professor of Romance Languages*.
Eleanor R. Gibbard,* M.A. (WVU), *Assistant Professor of French; Foreign Language Examiner*.
Pablo Gonzalez,* Ph.D. (U. Madrid), *Associate Professor of Spanish*.
Gary L. Harris,* Ph.D. (Ohio St. U.), *Associate Professor of Russian*.
Luis Harss, M.A. (Stanford U.), *Assistant Professor of Spanish*.
Donald T. Huffman,* M.A. (Ind. U.), *Assistant Professor of German*.
Joseph A. Murphy, Ph.D. (Ohio St. U.), *Associate Professor of French*.
Jean-Pierre Ponchie,* Ph.D. (Mich. St. U.), *Associate Professor of French*.
Joseph J. Prentiss,* Ph.D. (U. Pitt.), *Associate Professor of Classical Languages*.
Joseph F. Renahan,* M.S. (Yeshiva U.), *Associate Professor of Romance Languages*.
Jurgen Schlunk,* Ph.D. (Philipps U. Marburg), *Assistant Professor of German*.
William L. Siemens,* Ph.D. (U. Kans.), *Associate Professor of Spanish*.
Armand E. Siger, Ph.D. (Duke U.), *Professor of Romance Languages*.
Rosslyn M. Smith,* Ph.D. (U. N.M.), *Assistant Professor of Spanish and Linguistics*.
Janice Spleth,* Ph.D. (Rice U.), *Assistant Professor of French*.
Harley U. Taylor, Ph.D. (Ind. U.), *Associate Chairman and Professor of German*.
David Torres,* Ph.D. (U. Ill.), *Assistant Professor of Spanish*.
Stanley Whitley,* Ph.D. (Cornell U.), *Assistant Professor of Spanish and Linguistics*.

Geology and Geography

Alan C. Donaldson, Ph.D. (Penn St. U.), *Professor of Geology; Chairman*.
Robert E. Behling, Ph.D. (Ohio St. U.), *Associate Professor of Geology*.
Ping-fan Chen,* Ph.D. (VPI & St. U.), *Adjunct Professor of Geology*.
Chester L. Dodson,* M.S. (WVU), *Assistant Professor (part-time) of Geology*.
Robert B. Erwin, Ph.D. (Cornell U.), *Professor of Geology*.
Milton T. Heald, Ph.D. (Harvard U.), *Professor of Geology; Associate Chairman*.
Harley E. Johansen,* Ph.D. (U. Wisc.), *Assistant Professor of Geography; Assistant Chairman*.
Peter Lessing,* Ph.D. (Syracuse U.), *Adjunct Associate Professor of Geology*.
Richard S. Little, Ph.D. (Syracuse U.), *Associate Professor of Geography*.
William K. Overby,* B.S. (WVU), *Adjunct Assistant Professor of Geology*.
Douglas G. Patchen,* Ph.D. (Syracuse U.), *Adjunct Assistant Professor of Geology*.
Henry W. Rauch, Ph.D. (Penn. St. U.), *Associate Professor of Geology*.
John J. Renton, Ph.D. (WVU), *Professor of Geology*.
Robert C. Shumaker, Ph.D. (Cornell U.), *Professor of Geology*.
Richard A. Smosna, Ph.D. (U. Ill.), *Adjunct Assistant Professor of Geology*.
Francis T. C. Ting, Ph.D. (Penn. St. U.), *Associate Professor of Geology*.
Steven M. Warshauer, Ph.D. (U. Cincinnati), *Associate Professor of Geology*.
Russell L. Wheeler, Ph.D. (Princeton U.), *Associate Professor of Geology*.

History

William T. Doherty, Jr., Ph.D. (U. Mo.), *Professor and Chairman*.
William S. Arnett,* Ph.D. (Ohio St. U.), *Assistant Professor*.
Wesley M. Bagby, Ph.D. (Columbia U.), *Professor*.

William D. Barns, Ph.D. (WVU), *Professor*.
 John A. Caruso, Ph.D. (WVU), *Professor Emeritus*.
 Elizabeth Cometti, Ph.D. (U. Va.), *Professor Emeritus*.
 Charles W. Connell, Ph.D. (Rutgers U.), *Associate Professor*.
 Arthur L. Donovan, Ph.D. (Princeton U.), *Associate Professor*.
 Jack L. Hammersmith, Ph.D. (U. Va.), *Associate Professor; Assistant Chairman*.
 Elizabeth K. Hudson, Ph.D. (Ind. U.), *Associate Professor*.
 Mortimer Levine, Ph.D. (U. Penn.), *Professor*.
 William R. McLeod,* Ph.D. (U. Md.), *Assistant Professor*.
 Robert M. Maxon, Ph.D. (Syracuse U.), *Associate Professor*.
 John A. Maxwell, Ph.D. (WVU), *Associate Professor*.
 Dennis H. O'Brien,* Ph.D. (U. Ill.), *Assistant Professor*.
 George P. Parkinson, Jr., Ph.D. (U. Wisc.), *Assistant Professor; Curator, West Virginia Collection*.
 Kurt Rosenbaum, Ph.D. (Syracuse U.), *Professor*.
 Sarah R. Smith, Ph.D. (Columbia U.), *Associate Professor Emeritus*.
 Edward M. Steel, Jr., Ph.D. (U. N.C.), *Professor*.
 John C. Super,* Ph.D. (UCLA), *Assistant Professor*.
 John A. Williams, Jr., Ph.D. (Yale U.), *Professor*.

Library Science

Robert F. Munn, Ph.D. (U. Mich.), *Professor and Chairman; Dean of Library Services*.
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Urban Couch, M.F.A. (Cranbrook Acad. Art), *Adjunct Professor*.
Ardeth Deay,* Ph.D. (Cornell U.), *Assistant Professor*.
J. William Douglas, Ph.D. (Ohio St. U.), *Adjunct Professor*.
J. Christopher Eisele, Ph.D. (Ohio St. U.), *Assistant Professor*.
Robert Elkins, Ph.D. (U. Kans.), *Adjunct Professor*.
David A. England,* Ph.D. (Ind. U.), *Assistant Professor*.
Patricia K. Fehl, Ed.D. (Ind. U.), *Adjunct Professor*.
Boyd D. Holtan, Ed.D. (U. Ill.), *Professor*.
Leo Horacek, Ph.D. (U. Kans.), *Adjunct Professor*.
Ronald V. Iannone, Ed.D. (Syracuse U.), *Professor*.
Warren G. Kelly, Ed.D. (U. Mo.), *Professor*.
Robert L. Kurucz, Ph.D. (Ohio St. U.), *Adjunct Professor*.

Betholene F. Love,* M.S. (U. Okla.), *Adjunct Professor*.
 O. Claude McGhee, Ph.D. (Ohio St. U.), *Adjunct Professor*.
 Paul R. McGhee, Ph.D. (Syracuse U.), *Associate Professor*.
 C. Everett Marcum, H.S.D. (Ind. U.), *Adjunct Professor*.
 Roy A. Moxley, Ph.D. (U. Mich.), *Associate Professor*.
 Joseph A. Murphy, Ph.D. (Ohio St. U.), *Adjunct Associate Professor*.
 C. Kenneth Muray, Ph.D. (Ohio St. U.), *Professor*.
 Patricia A. Obenauf, Ed.D. (U. Va.), *Associate Professor*.
 Franklin Parker, Ed.D. (Geo. Peabody C.), *Claude Worthington Benedum Professor of Education*.
 Perry D. Phillips,* Ed.D. (WVU), *Associate Professor*.
 Helen Plants, M.S.C.E. (WVU), *Adjunct Professor*.
 Ronald L. Redick, Ph.D. (Ohio St. U.), *Assistant Professor*.
 John T. Sears, Ph.D. (Princeton U.), *Adjunct Associate Professor*.
 Wallace S. Venable,* Ed.D. (WVU), *Adjunct Assistant Professor*.
 Charles E. Wales, Ph.D. (Purdue U.), *Adjunct Professor*.
 Charles D. Wilhelm,* Ed.D. (U. Fla.), *Assistant Professor*.
 C. Peter Yost, Ph.D. (U. Pitt.), *Adjunct Professor*.

Education Administration

James A. Martin, Ed.D. (U. Tenn.), *Professor and Chairman*.
 John O. Andes, Ed.D. (U. Fla.), *Professor*.
 Laddie R. Bell, Ed.D. (U. Va.), *Professor; Assistant Dean for Off-Campus Education*.
 John Brisbane, Ed.D. (WVU), *Assistant Professor; Dean of Admissions and Records*.
 Gene A. Budig, Ed.D. (U. Nebr.), *Professor; President of WVU*.
 Wilson I. Gautier, Ed.D. (WVU), *Professor*.
 Ernest R. Goeres,* Ph.D. (U. Iowa), *Associate Professor; Assistant Dean for Fiscal Affairs*.
 Harold I. Goodwin, Ph.D. (U. Cal.), *Professor*.
 Arthur N. Hofstetter, Ed.D. (U. Va.), *Professor; Associate Dean for Teacher Education*.
 H. Edward Lilley,* Ph.D. (Tex. A&M U.), *Assistant Professor*.
 Richard F. Meckley, Ph.D. (Ohio St. U.), *Professor*.
 William G. Monahan, Ed.D. (Mich. St. U.), *Professor; Dean of the College*.
 John R. Pisapia, Ed.D. (WVU), *Assistant Professor*.
 Edwin R. Smith, Ed.D. (WVU), *Associate Professor; Coordinator of Institutional Research, President's Office*.

Educational Psychology

Benjamin H. Bailey, Ed.D. (U. Fla.), *Professor and Chairman*.
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 Lawrence E. Fraley, Ed.D. (U. So. Cal.), *Associate Professor*.
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 Daniel E. Hursh, Ph.D. (U. Kans.), *Assistant Professor*.
 Rogers McAvoy, Ph.D. (Ind. U.), *Professor*.
 Anne H. Nardi, Ph.D. (WVU), *Associate Professor*.
 John J. Paterson, Ed.D. (Mich. St. U.), *Professor*.
 Michael D. Scott, Ph.D. (U. So. Cal.), *Adjunct Associate Professor*.
 Meng-shu Tseng, Ed.D. (Ind. U.), *Professor*.
 Ernest A. Vargas, Ph.D. (U. Pitt.), *Associate Professor*.
 Julie S. Vargas, Ph.D. (U. Pitt.), *Associate Professor*.
 Richard T. Walls, Ph.D. (Penn. St. U.), *Professor*.
 Mary I. Yeazell, Ed.D. (U. Ill.), *Professor*.

Family Resources

John A. Shultz, Ph.D. (Ohio St. U.), *Professor and Chairman*.
 Margaret J. Albrink, M.D. (Yale U.), *Professor of Medicine; Adjunct Professor*.
 Gladys R. Ayersman,* M.S. (WVU), *Assistant Professor Emeritus*.
 Sara Ann Brown, Ph.D. (Iowa St. U.), *Professor Emeritus*.

Montelle Dietrich,* M.S. (U. Minn.), *Associate Professor Emeritus*.
 Wanda K. Franz, Ph.D. (WVU), *Assistant Professor*.
 S. Jane Goodman, Ph.D. (Penn. St. U.), *Associate Professor*.
 Babette Graf,* M.S. (Penn. St. U.), *Associate Professor*.
 Joann L. Guthrie,* M.S. (WVU), *Assistant Professor*.
 Mary Rose Jones,* M.S. (WVU), *Associate Professor Emeritus*.
 Reva Belle Neely,* M.E. (Colo. St. U.), *Associate Professor Emeritus*.
 M. Zafar Nomani, Ph.D. (Rutgers U.), *Assistant Professor*.
 Betty Lou Ramsey,* M.S. (U. Tenn.), *Associate Professor*.
 Dottie D. Rauch,* M.Ed. (Penn. St. U.), *Assistant Professor*.
 Sharon S. Redick,* Ph.D. (Iowa St. U.), *Assistant Professor*.
 Brenda Sue Sciscroe,* M.S. (Purdue U.), *Assistant Professor*.
 Carl B. Taylor, Ph.D. (Penn. St. U.), *Professor*.
 Ruth E. Weibel,* M.S. (U. Tenn.), *Associate Professor*.
 Jeraldine L. Withycombe, Ph.D. (U. Conn.), *Assistant Professor*.
 Janice I. Yeager,* M.S. (U. Ill.), *Associate Professor*.

Health Education

Bill R. Carlton, Ed.D. (U. Tenn.), *Associate Professor; Chairman*.
 Frederick J. Holter, Ph.D. (NYU), *Professor Emeritus*.

Reading

Thomas C. Hatcher, Ph.D. (Ohio St. U.), *Professor; Coordinator*.
 Lawrence G. Erickson, Ph.D. (U. Wisc.), *Associate Professor*.
 Marilyn M. Fairbanks, Ed.D. (WVU), *Associate Professor*.
 John P. Helfeldt, Ph.D. (Syracuse U.), *Assistant Professor*.
 Eddie C. Kennedy, Ed.D. (Ind. U.), *Professor Emeritus*.
 Jerilyn K. Ribovich,* Ph.D. (U. Md.), *Assistant Professor*.
 Martin Saltz, Ph.D. (U. Conn.), *Associate Professor*.
 Patricia K. Smith,* Ed.D. (WVU), *Assistant Professor*.

Special Education

J. Eugene Clements, Ed.D. (U. Kans.), *Associate Professor*.
 Thomas P. Lombardi, Ed.D. (U. Ariz.), *Professor*.
 Gabriel A. Nardi, Ph.D. (U. Wisc.), *Professor*.
 Robert H. Neff, Ed.D. (WVU), *Professor Emeritus*.
 John S. Platt,* Ed.D. (U. Kans.), *Assistant Professor*.
 Annette Shuck,* Ed.D. (WVU), *Assistant Professor*.

Speech Pathology and Audiology

Norman J. Lass, Ph.D. (Purdue U.), *Professor and Chairman*.
 Wayne G. Bodenheimer,* Ph.D. (U. Pitt.), *Assistant Professor*.
 Paul T. Fogle,* Ph.D. (U. Iowa), *Assistant Professor*.
 Dennis M. Ruscello,* Ph.D. (U. Ariz.), *Assistant Professor*.
 Kenneth O. St. Louis,* Ph.D. (U. Minn.), *Assistant Professor*.
 Mary Ellen Tekieli,* Ph.D. (U. Okla.), *Assistant Professor*.

Technology Education

Paul W. DeVore, Ed.D. (Penn. St. U.), *Professor and Chairman*.
 Thomas J. Brennan, Ed.D. (Bradley U.), *Professor Emeritus*.
 David L. DePue,* Ph.D. (Ohio St. U.), *Associate Professor*.
 John B. DuVall, Ph.D. (U. Md.), *Associate Professor*.
 David L. McCrory,* Ph.D. (Case West. Res. U.), *Associate Professor*.
 Charles A. Pinder, Ph.D. (U. Md.), *Associate Professor*.

Interdisciplinary Programs

Genetics and Developmental Biology

- Joginder Nath, Ph.D. (U. Wisc.), *Professor of Genetics; Chairman, Interdisciplinary Faculty.*
- David F. Blaydes, Ph.D. (Ind. U.), *Associate Professor of Biology.*
- Donald F. Butcher, Ph.D. (Iowa St. U.), *Professor of Statistics.*
- Roy L. Butcher, Ph.D. (Iowa St. U.), *Associate Professor of Obstetrics and Gynecology and Anatomy.*
- Linda Butler, Ph.D. (U. Ga.), *Professor of Entomology.*
- Franklin C. Cech, Ph.D. (Tex. A&M U.), *Professor of Forest Genetics.*
- Nyles W. Charon, Ph.D. (U. Minn.), *Assistant Professor of Microbiology.*
- Dan L. Cunningham,* Ph.D. (Tex. A&M U.), *Assistant Professor of Animal Science.*
- Robert S. Dunbar, Jr., Ph.D. (Cornell U.), *Professor of Animal Science.*
- John S. Ellingson, Ph.D. (U. Mich.), *Associate Professor of Biochemistry.*
- Vincent F. Gerencser, Ph.D. (U. Ky.), *Associate Professor of Microbiology.*
- John E. Hall, Ph.D. (Purdue U.), *Professor of Microbiology.*
- Barbara Jones, M.D. (U. Utah), *Professor of Pediatrics.*
- Walter J. Kaczmarczyk, Ph.D. (Hahnemann Med. C.), *Professor of Genetics.*
- Sam Katz, Ph.D. (Northwestern U.), *Associate Professor of Biochemistry.*
- Edward C. Keller, Jr. Ph.D. (Penn. St. U.), *Professor of Biology.*
- Billy E. Kirk, Ph.D. (Ohio St. U.), *Associate Professor of Microbiology.*
- Robert E. McCafferty, Ph.D. (U. Pitt.), *Professor of Anatomy; Research Associate in Obstetrics and Gynecology.*
- Marvin R. McClung, Ph.D. (Iowa St. U.), *Professor of Animal Science.*
- Henry F. Mengoli, Ph.D. (Cath. U. Am.), *Associate Professor of Microbiology; Research Associate in Pathology.*
- Ethel C. Montiegel,* M.S. (WVU), *Associate Professor of Biology.*
- Oliver M. Neal, Ph.D. (Mich. St. U.), *Professor of Horticulture.*
- Dennis O. Overman, Ph.D. (U. Mich.), *Associate Professor of Anatomy.*
- Robert S. Pore, Ph.D. (U. Cal.), *Associate Professor of Microbiology.*
- Dennis C. Quinlan, Ph.D. (U. Rochester), *Assistant Professor of Biology.*
- Randell W. Reyer, Ph.D. (Yale U.), *Professor of Anatomy.*
- Martin W. Schein, Sc.D. (J. Hopkins U.), *Centennial Professor of Biology and of Behavioral Medicine and Psychiatry.*
- William V. Thayne,* Ph.D. (U. Ill.), *Associate Professor of Statistics.*
- George P. Tryfiates, Ph.D. (Rutgers U.), *Associate Professor of Biochemistry.*
- Valentin Ulrich, Ph.D. (Rutgers U.), *Professor of Genetics.*
- Knox Van Dyke, Ph.D. (St. Lou. U.), *Professor of Pharmacology.*
- Stanley Wearden, Ph.D. (Cornell U.), *Professor of Statistics; Dean, Graduate School; Associate Provost for Research and Graduate Studies.*
- Leah A. Williams, Ph.D. (WVU), *Associate Professor of Biology.*
- David B. Yelton, Ph.D. (U. Mass.), *Assistant Professor of Microbiology.*

Reproductive Physiology

- E. Keith Inskeep, Ph.D. (U. Wisc.), *Professor of Animal Science; Chairman, Interdisciplinary Faculty.*
- Gerald C. Anderson, Ph.D. (U. Mo.), *Professor of Animal Science.*
- Roy L. Butcher, Ph.D. (Iowa St. U.), *Assistant Professor of Obstetrics and Gynecology.*
- William E. Collins, Ph.D. (U. Wisc.), *Professor of Biology; Dean, College of Arts and Sciences.*
- Robert A. Dailey, Ph.D. (U. Wisc.), *Assistant Professor of Animal Science.*
- Robert E. McCafferty, Ph.D. (U. Pitt.), *Professor of Anatomy.*
- Michael G. Mawhinney, Ph.D. (WVU), *Associate Professor of Pharmacology and Urology.*
- Donald J. Horvath, Ph.D. (Cornell U.), *Professor of Animal Science.*
- John E. Jones,* M.D. (U. Utah), *Professor of Medicine; Dean, School of Medicine.*
- Harold E. Kidder, Ph.D. (U. Wisc.), *Professor of Animal Science.*

Robert E. McCafferty, Ph.D. (U. Pitt.), *Professor of Anatomy*.
 Michael G. Mawhinney, Ph.D. (WVU), *Associate Professor of Pharmacology and Urology*.
 Walter H. Moran, Jr., M.D. (Harvard U.), *Professor of Surgery*.
 Joginder Nath, Ph.D. (Mich. St. U.), *Professor of Genetics*.
 Ronald A. Peterson, Ph.D. (Mich. St. U.), *Associate Professor of Animal Science*.
 John A. Thomas, Ph.D. (U. Iowa), *Professor of Pharmacology*.
 James A. Welch, Ph.D. (U. Ill.), *Professor of Animal Science*.

African Studies

Rodger D. Yeager, Ph.D. (Syracuse U.), *Coordinator, Office of International Programs; Associate Professor of Political Science; Chairman, African Studies*.
 Vance Q. Alvis, Ph.D. (U. Va.), *Professor of Economics*.
 Gerald C. Anderson, Ph.D. (U. Mo.), *Professor of Animal Science*.
 Wesley M. Bagby, Ph.D. (Columbia U.), *Professor of History*.
 Newton M. Baughman, Ph.D. (Purdue U.), *Professor of Agronomy*.
 Philip Bordinat, Ph.D. (U. Birmingham, Eng.), *Professor of English*.
 Thomas C. Campbell, Jr., Ph.D. (U. Pitt.), *Professor of Economics*.
 Robert S. Dunbar, Jr., Ph.D. (Cornell U.), *Professor of Animal Science*.
 Philip J. Faini,* M.M. (WVU), *Professor of Music*.
 Mannon E. Gallegly, Ph.D. (U. Wisc.), *Professor of Plant Pathology; Chairman, Division of Plant Sciences*.
 Harold A. Gibbard, Ph.D. (U. Mich.), *Professor Emeritus of Sociology*.
 Leon H. Ginsberg, Ph.D. (U. Okla.), *Professor of Social Work*. (On Leave)
 Henry W. Hurlbutt, Jr., Ph.D. (U. Md.), *Associate Professor of Biology*.
 Marvin R. McClung, Ph.D. (Iowa St. U.), *Professor of Animal Science*.
 Robert M. Maxon, Ph.D. (Syracuse U.), *Associate Professor of History*.
 Robert F. Munn, Ph.D. (U. Mich.), *Chairman and Professor of Library Science; Dean of Library Services*.
 Ralph E. Nelson, Ph.D. (U. Minn.), *Professor of Agricultural Economics; Vice Provost for Academic Affairs*.
 Ernest J. Nesius, Ph.D. (Iowa St. U.), *Professor Emeritus of Agricultural Economics*.
 Franklin Parker, Ed.D. (Geo. Peabody C.), *Claude Worthington Benedum Professor of Education*.
 Willem A. van Eck, Ph.D. (Mich. St. U.), *Professor of Soil Science*.
 James A. Welch, Ph.D. (U. Ill.), *Professor of Animal Science*.
 Dale W. Zinn, Ph.D. (U. Mo.), *Dean, College of Agriculture and Forestry; Professor of Animal Science*.

School of Journalism

Guy H. Stewart, Ph.D. (U. Ill.), *Professor and Dean*.
 Paul A. Atkins,* M.A. (U. Va.), *Professor*.
 Donovan H. Bond,* M.A. (WVU), *Professor*.
 Charles F. Cremer,* Ph.D. (U. Iowa), *Professor*.
 Harry W. Elwood,* M.S.J. (Northwestern U.), *Associate Professor*.
 Frank M. Kearns, A.B. (WVU), *Claude Worthington Benedum Professor*.
 David L. Martinson,* Ph.D. (U. Minn.), *Assistant Professor*.
 Hunter P. McCartney, Ph.D. (U. Penn.), *Professor*.
 Robert M. Ours,* Ph.D. (C. Wm. & Mary), *Associate Professor*.
 P. Michael Ryan, Ph.D. (So. Ill. U.), *Associate Professor*.
 William R. Summers, Jr.,* M.A. (U. Mo.), *Professor*.
 C. Gregory Van Camp,* M.S.J. (WVU), *Associate Professor*.

Medical Center Basic Sciences

Anatomy

Randall W. Reyer, Ph.D. (Yale U.), *Professor; Acting Chairman*.
 William A. Beresford, D.Phil. (Oxford U.), *Professor*.

Roy L. Butcher, Ph.D. (Iowa St. U.), *Associate Professor*.
 Stephen W. Carmichael, Ph.D. (Tulane U.), *Associate Professor*.
 James L. Culberson, Ph.D. (Tulane U.), *Associate Professor*.
 Richard G. Frederickson, Ph.D. (U. N.D.), *Associate Professor*.
 Morton H. Friedman, Ph.D. (U. Tenn.), *Associate Professor*.
 Duane E. Haines, Ph.D. (Mich. St. U.), *Associate Professor*.
 Rusi A. Hilloowala,* Ph.D. (U. Ala.), *Associate Professor*.
 David E. Hinton, Ph.D. (U. Miss.), *Associate Professor*.
 David S. Jones, Ph.D., M.D. (U. Minn., Loyola U.), *Professor Emeritus*.
 Donald L. Kimmel, Ph.D. (U. Mich.), *Professor Emeritus*.
 Normal J. Lass, Ph.D. (Purdue U.), *Associate Professor (part-time)*.
 Robert E. McCafferty, Ph.D. (U. Pitt.), *Professor*.
 Dennis O. Overman, Ph.D. (U. Mich.), *Associate Professor*.
 Carlin A. Pinkstaff, Ph.D. (Emory U.), *Associate Professor*.
 Robert S. Pope,* Ph.D. (U. N.D.), *Assistant Professor*.
 T. Walley Williams, Ph.D. (U. Pitt.), *Professor Emeritus*.

Biochemistry

Eugene G. Sander, Ph.D. (Cornell U.), *Professor and Chairman*.
 James B. Blair, Ph.D. (U. Va.), *Associate Professor*.
 William J. Canady, Ph.D. (Geo. Wash. U.), *Professor*.
 John S. Ellingson, Ph.D. (U. Mich.), *Associate Professor*.
 Charles L. Harris, Ph.D. (U. Ill.), *Associate Professor*.
 Singanallur N. Jagannathan, Ph.D. (U. Bombay), *Associate Professor; Associate Professor of Pathology*.
 Sam Katz, Ph.D. (Northwestern U.), *Associate Professor*.
 Ray Koppelman, Ph.D. (U. Chicago), *Professor; Provost for Energy Studies, Graduate Programs and Research*.
 Reginald F. Krause, Ph.D. (U. Rochester), *Professor Emeritus*.
 Gale W. Rafters, Ph.D. (U. Wash.), *Professor*.
 Harold Resnick, Ph.D. (U. Iowa), *Professor*.
 George P. Tryfiates, Ph.D. (Rutgers U.), *Associate Professor*.
 George H. Wirtz, Ph.D. (Geo. Wash. U.), *Professor*.

Microbiology

Irvin S. Snyder, Ph.D. (U. Kans.), *Professor and Chairman*.
 Robert G. Burrell, Ph.D. (Ohio St. U.), *Professor*.
 Nyles W. Charon, Ph.D. (U. Minn.), *Assistant Professor*.
 Samuel J. Deal, Ph.D. (U. Minn.), *Professor*.
 Rama Ganguly, Ph.D. (U. Calcutta), *Assistant Professor (Medicine)*.
 Vincent F. Gerencser, Ph.D. (U. Ky.), *Associate Professor*.
 John E. Hall, Ph.D. (Purdue U.), *Professor*.
 Billy E. Kirk, Ph.D. (Ohio St. U.), *Associate Professor*.
 Pervis C. Major, Ph.D. (WVU), *Assistant Professor (part-time)*.
 Henry F. Mengoli, Ph.D. (Cath. U. Am.), *Associate Professor*.
 Stephen A. Olenchok, Ph.D. (WVU), *Assistant Professor*.
 Robert S. Pore, Ph.D. (U. Cal.), *Associate Professor*.
 Thomas M. Sodeman, M.D. (U. Va.), *Professor (Pathology)*.
 Herbert A. Thompson, Ph.D. (U. Kans.), *Assistant Professor*.
 Robert W. Veltri, Ph.D. (WVU), *Professor*.
 Herbert G. Voelz, Dr.rer.nat. (St. U. Greifswald, Ger.), *Professor*.
 David B. Yelton, Ph.D. (U. Mass.), *Assistant Professor*.

Pathology and Medical Technology

Samuel Shi-Ming Chou, Ph.D. (U. Wisc.), *Professor of Pathology*.
 Milton R. Hales,* M.D. (U. Sou. Cal.), *Professor of Pathology*.

Singanallur N. Jagannathan, Ph.D. (U. Bombay), *Associate Professor of Pathology*.
 John M. Krall, Ph.D. (U. Iowa), *Associate Professor of Biostatistics*.
 Betholene F. Love,* M.S. (U. Okla.), *Professor and Associate Coordinator of Medical Technology*.
 Henry F. Mengoli, Ph.D. (Cath. U. Am.), *Associate Professor of Microbiology*.
 Dane W. Moore, Jr.,* M.S. (WVU), *Professor of Medical Technology*.
 Nathaniel F. Rodman, M.D. (U. Penn.), *Professor and Chairman of Pathology*.
 Thomas M. Sodeman, M.D. (U. Va.), *Professor of Pathology; Coordinator, Medical Technology*.

Pharmacology

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 Albert J. Azzaro, Ph.D. (WVU), *Associate Professor of Neurology and Pharmacology*.
 John U. Bell, Ph.D. (Dalhousie U.), *Assistant Professor*.
 Brenda K. Colasanti, Ph.D. (WVU), *Associate Professor of Ophthalmology and Pharmacology*.
 Charles R. Craig, Ph.D. (U. Wisc.), *Professor*.
 Robert W. Graves, D.D.S. (WVU), *Associate Professor of Dentistry and Pharmacology*.
 Michael G. Mawhinney, Ph.D. (WVU), *Associate Professor of Urology and Pharmacology*.
 Mark J. Reasor, Ph.D. (J. Hopkins U.), *Assistant Professor*.
 Robert L. Robinson, Ph.D. (U. Kans.), *Professor*.
 David J. Smith, Ph.D. (WVU), *Associate Professor of Anesthesiology and Pharmacology*.
 Robert E. Stitzel, Ph.D. (U. Minn.), *Professor*.
 John A. Thomas, Ph.D. (U. Iowa), *Professor; Associate Dean, Administration*.
 Pedro R. Urquilla, M.D. (U. El Salv.), *Associate Professor*.
 Knox Van Dyke, Ph.D. (St. Louis U.), *Professor*.
 David P. Westfall, Ph.D. (WVU), *Professor*.

Physiology and Biophysics

George A. Hedge, Ph.D. (Stanford U.), *Professor and Chairman*.
 Ping Lee, Ph.D. (Duke U.), *Professor*.
 Paul B. Brown, Ph.D. (U. Chi.), *Associate Professor*.
 Howard D. Colby, Ph.D. (SUNY, Buffalo), *Associate Professor*.
 Gunter N. Franz, Ph.D. (U. Wash.), *Associate Professor*.
 David G. Frazer, Ph.D. (WVU), *Assistant Professor*.
 Wilbert E. Gladfelter, Ph.D. (U. Penn.), *Associate Professor*.
 Ludwig Gutmann, M.D. (Columbia U.), *Professor (Neurology)*.
 Philip R. Miles, Ph.D. (WVU), *Associate Professor*.
 Ronald J. Millecchia, Ph.D. (Rockefeller U.), *Associate Professor*.
 Walter H. Moran, Jr., M.D. (Harvard U.), *Professor (Surgery)*.
 Mary L. Morgan,* Ph.D. (Mich. St. U.), *Assistant Professor*.
 LauraLee Sherwood,* D.V.M. (Mich. St. U.), *Associate Professor*.
 Kenneth C. Weber, Ph.D. (U. Minn.), *Professor*.

College of Mineral and Energy Resources

Charles T. Holland, M.S.E.M. (WVU), *Professor Emeritus*.
 Jay Hilary Kelley, Ph.D. (Penn. St. U.), *Professor*.
 Kenneth K. Humphreys, P.E., M.S.E. (WVU), *Professor*.
 Calvin J. Konya,* Ph.D. (U. Mo.), *Associate Professor*.
 Walter C. Labys, Ph.D. (Nottingham U.), *Associate Professor*.
 Richard W. Laird,* M.S.E.M. (WVU), *Professor (part-time)*.
 Joseph W. Leonard,* M.S. (Penn St. U.), *Professor*.
 Joseph D. McClung, M.S.E.M. (U. Pitt.), *Associate Professor Emeritus*.
 Richard B. Muter, M.S. (WVU), *Assistant Professor*.
 Richard T. Newcomb, Ph.D. (U. Minn.), *Professor*.
 Syd S. Peng, Ph.D. (Stanford U.), *Associate Professor*.

Herman H. Rieke, Ph.D. (U. So. Cal.), *Associate Professor*.
Ernest J. Sandy, M.S.E.M. (U. Pitt.), *Associate Professor*.
Duane Skidmore, Ph.D. (Fordham U.), *Professor*.
James A. Wasson,* M.S. (Penn St. U.), *Associate Professor*.

School of Pharmacy

Pharmaceutical Sciences

Louis A. Luzzi, Ph.D. (U. R.I.), *Professor of Pharmaceutics; Dean, School of Pharmacy*.
H. John Baldwin, Ph.D. (Purdue U.), *Associate Professor of Pharmacy Administration*.
Calvin C. Brister,* Ph.D. (U. Miss.), *Associate Professor of Pharmacy*.
Nicholas H. Choulis, Ph.D. (U. London), *Professor of Pharmacy and Pharmaceutical Chemistry*.
Stephen A. Howard,* Ph.D. (U. Mich.), *Assistant Professor of Pharmacy*.
Arthur Jacknowitz,* Pharm.D. (Phila. C. Pharm.), *Assistant Professor of Clinical Pharmacy*.
James Khai-Jin-Lim, Ph.D. (U. N.C.), *Professor of Pharmaceutics*.
Joseph K. H. Ma, Ph.D. (Duquesne U.), *Assistant Professor of Pharmacy*.
Carl J. Malanga, Ph.D. (Fordham U.), *Associate Professor of Pharmacy*.
Louis C. Martinelli, Ph.D. (U. Cal.), *Associate Professor of Medicinal Chemistry; Coordinator, Clinical Pharmacy*.
John W. Mauger, Ph.D. (U. R.I.), *Associate Professor of Pharmacy*.
Richard P. Miller, Ph.D. (U. Iowa), *Assistant Professor of Biopharmaceutics*.
Frank D. O'Connell, Ph.D. (Purdue U.), *Professor of Pharmacognosy; Assistant Dean*.
John P. O'Donnell, Ph.D. (U. Iowa), *Assistant Professor of Medicinal Chemistry*.
David Riley,* Ed.D. (U. Ga.), *Assistant Professor of Pharmacy Administration*.
Eugene S. Stratford, Ph.D. (Ohio U.), *Associate Professor of Medicinal Chemistry*.
Albert F. Wojcik, Ph.D. (U. Pitt.), *Professor of Pharmacy Administration*.

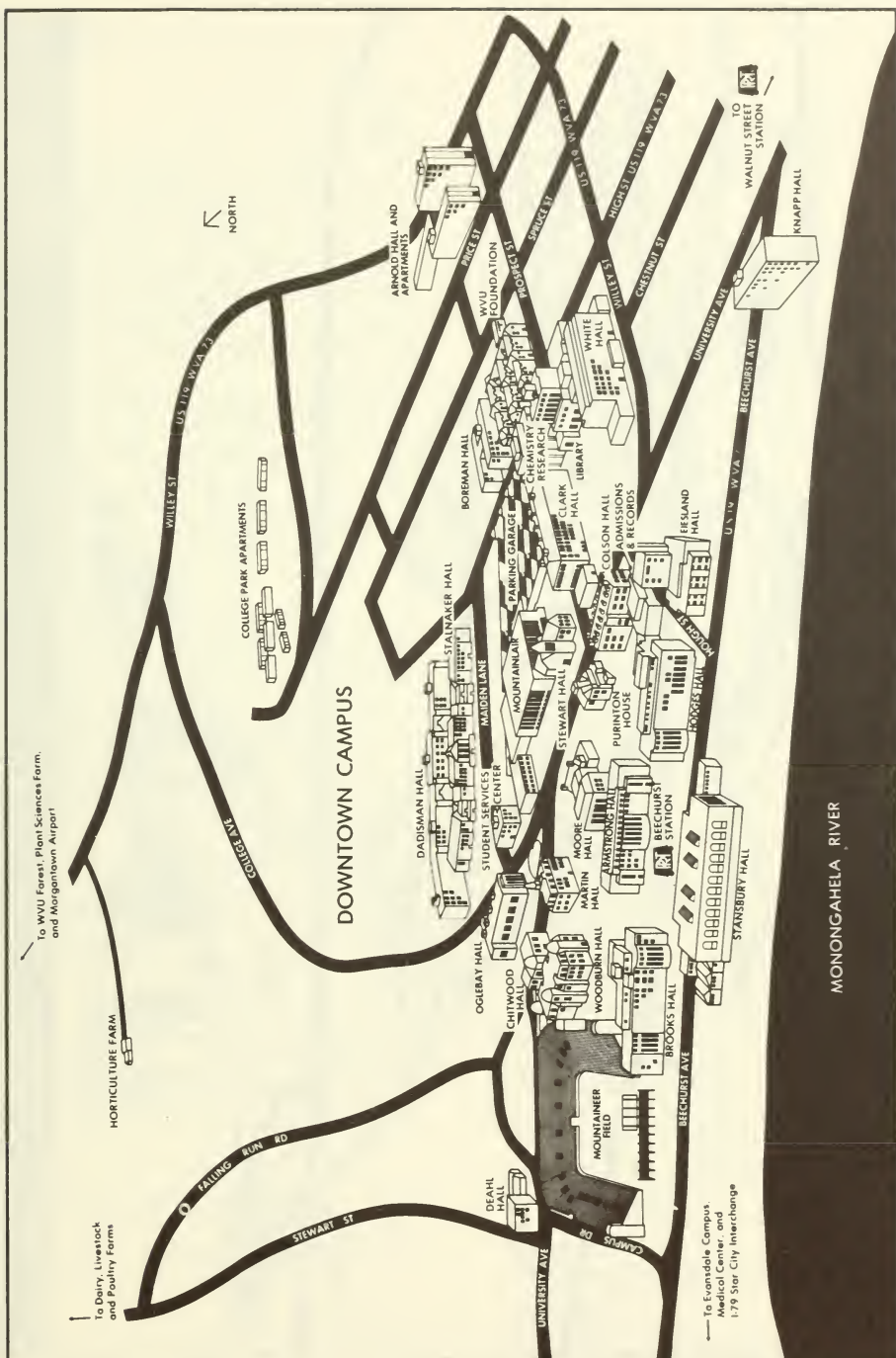
School of Physical Education

C. Peter Yost, Ph.D. (U. Pitt.), *Professor; Dean, School of Physical Education*.
William L. Alsop, Ed.D. (WVU), *Associate Professor*.
Kittie J. Blakemore,* M.S. (WVU), *Associate Professor*.
William A. Bonsall,* M.S. (WVU), *Associate Professor*.
Leland E. Byrd,* Ed.D. (WVU), *Professor; Director, Intercollegiate Athletics*.
Daniel E. Della-Giustina,* Ph.D. (Mich. St. U.), *Associate Professor*.
J. William Douglas, Ph.D. (Ohio St. U.), *Professor; Chairman, Professional Physical Education*.
Patricia K. Fehl, Ed.D. (Ind. U.), *Professor; Chairwoman, General Physical Education*.
Mary K. Gallivan,* M.Ed. (Colo. St. U.), *Instructor*.
Robert L. Kurucz, Ph.D. (Ohio St. U.), *Professor; Chairman, Graduate Studies Advisory Committee*.
C. Everett Marcum, H.S.D. (Ind. U.), *Professor; Chairman, Safety Studies*.
Andrew C. Ostrow, Ph.D. (U. Cal.), *Associate Professor*.
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